




***CENTENNIAL MANDALONG PTY LTD***  
***Mandalong Mine***  
***ANNUAL REVIEW***

**March 2024**

## Annual Review Title Block

Name of Operation	Mandalong Mine
Name of Operator	Centennial Mandalong Pty Ltd
Development Consent/ Project Approval #	SSD-5144, SSD-5145, DA 35-2-2004.
Name of holder of Development Consent/ Project Approval	Centennial Mandalong Pty Ltd
Mining Lease #	CCL 762 CCL 746 Sub-Lease Mining Purposes Lease 191 Mining Lease 1443 Mining Lease 1543 Mining Lease 1553 Mining Lease 1722 Mining Lease 1744 Mining Lease 1793 Mining Lease 1852
Name of Holder of Mining Lease	Centennial Mandalong Pty Ltd
Water License #	WAL39767
Name of Holder of Water License	Centennial Mandalong Pty Ltd
Annual Review Start Date	1 January 2023
Annual Review End Date	31 December 2023
<p>I, <u>Craig Shales</u> certify that this audit report is a true and accurate record of the compliance status of Centennial Mandalong for the period 1 January to 31 December 2023 and that I am authorised to make this statement on behalf of Centennial Mandalong Pty Ltd.</p> <p>Note:</p> <p>a) The Annual Review is an 'environmental audit' for the purposes of s122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion) in an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.</p> <p>b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents –maximum penalty 2 years imprisonment or \$22,000, or both).</p>	
Name of Authorised Reporting Officer	Craig Shales
Title of Authorised Reporting Officer	Mine Manager
Signature of Authorised Reporting Officer	
Date	19/3/24

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## Plans

Plan Reference	Plan Name
CM00310	Mandalong Mine Monthly Production 2023
CM00315b	Cooranbong Service Site Location of Environmental Monitoring Points
CM00315c	Delta Entry Site Locations of Environmental Monitoring Points
CM00315d	Mandalong Mine Location of Environmental Monitoring Points
CM00315f	Mandalong South Surface Site Location of Environmental Monitoring Points

## Appendices

Appendix No.	Appendix Name
1	Independent Environmental Audit Action Plan

# 1 STATEMENT OF COMPLIANCE

The compliance status of the Mandalong Mine for the year 2023 is presented in **Table 1-1**. During the reporting period there were three non-compliances. **Table 1-2** presents a summary of the non-compliances.

**Table 1-1: Statement of Compliance**

<b>Were all conditions of the relevant approval(s) complied with?</b>	
<b>SSD-5144 (MOD10)</b>	No
<b>SSD-5144 Mandalong Southern Extension Project Statement of Commitments</b>	Yes
<b>SSD-5144 MOD 1 Statement of Commitments</b>	Yes
<b>SSD-5144 MOD 6 Statement of Commitments</b>	Yes
<b>SSD-5144 MOD 7 Statement of Commitments</b>	Yes
<b>SSD-5145 (MOD 1)</b>	Yes
<b>DA35-2-2004 (MOD 1)</b>	Yes
<b>EPL 365</b>	No
<b>Mining Lease 1443</b>	No
<b>Mining Lease 1543</b>	No
<b>Mining Lease 1553</b>	No
<b>Mining Lease 1722</b>	No
<b>Mining Lease 1744</b>	No
<b>Mining Lease 1793</b>	No
<b>Mining Lease 1852</b>	Yes
<b>Mining Purposes Lease 191</b>	No
<b>Consolidated Coal Lease 762</b>	No
<b>Consolidated Coal Lease 764</b>	Yes
<b>WAL39767</b>	Yes
<b>EPBC Approval 2013/6906</b>	Yes



**Table 1-2: 2023 Non-Compliances**

Relevant Approval	Condition #	Condition summary	Compliance Status	Comment	Where Addressed in Annual Review
EPL365	L5.1	Noise Limits	Non-Compliant	Sleep disturbance criteria exceedance.	Table 11-1
SSD-5144	Schedule 3, Condition 2	Operational Noise Criteria	Non-Compliant	Sleep disturbance criteria exceedance.	Table 11-1
CCL 762 ML 1443 ML 1543 ML 1553 ML 1722 ML 1744 ML 1793 MPL 191	Schedule 8A, Mining Regulation 2016	Failure to submit Rehabilitation Cost Estimate and Annual Rehabilitation Report and Forward Program by the due date.	Non-compliant	A large mine must submit an Annual Report and Forward Program, and a Rehabilitation Cost Estimate	Table 11-2

Note: Compliance Status Key for Table 1-2

Risk Level	Colour Code	Description
<b>High</b>	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
<b>Medium</b>	Non-Compliant	Non-compliance with: <ul style="list-style-type: none"> <li>Potential for serious environmental consequences, but is unlikely to occur; or</li> <li>Potential for moderate environmental consequences, but is likely to occur</li> </ul>
<b>Low</b>	Non-Compliant	Non-compliance with: <ul style="list-style-type: none"> <li>Potential for moderate environmental consequences, but is unlikely to occur; or</li> <li>Potential for low environmental consequences, but is likely to occur</li> </ul>
<b>Administrative</b>	Non-Compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

## 2 INTRODUCTION

Mandalong Mine is owned and operated by Centennial Mandalong Pty Ltd (Centennial Mandalong), a subsidiary of Centennial Coal Company Limited ('Centennial').

Mandalong Mine is a modern underground longwall operation located on the western side of Lake Macquarie near Morisset and west of the M1 Motorway. The Mine is situated approximately 130 km north of Sydney and 50 km from the Port of Newcastle, supplying up to 6.5 million tonnes of coal to the domestic power and export markets (Figure 2-1).

The Mandalong Mine comprises the underground workings and surface infrastructure of:

- The Mandalong Mine underground workings including longwall panels, development units and surface infrastructure located near Morisset;
- The Cooranbong Entry Site, consisting of the Cooranbong Colliery underground workings and surface infrastructure located near Dora Creek;
- The Mandalong South Surface Site located off Mandalong Road; and
- The Delta Entry Site, which encompasses an entry and coal delivery system, located near Wyee at the Vales Point Rail Unloader Facility.

An Environmental Impact Statement (EIS) was submitted in 1997 and a Commission of Inquiry held in 1998. The Mine was granted development consent DA 97/800, in October 1998. After obtaining development consent, Centennial constructed the Mandalong Mine site and decline tunnel to access the Mandalong mining area. Longwall mining operations at Mandalong commenced in January 2005. The Mine has approval to extract up to 6.5 million tonnes per annum of coal from the West Wallarah Seam and Wallarah-Great Northern Seam using the longwall mining method.

Development consent DA 35/2/2004 granted in July 2004 by the then NSW Department of Planning & Infrastructure approved the construction and operation of the coal handling and clearance system at the Delta Entry Site. Construction of the Delta Coal Clearance System was completed in 2006. The Cooranbong Entry Site and the Delta Entry Site contain coal handling infrastructure, enabling the Mandalong Mine to process and convey as permitted by their respective development consents up to 10 million tonnes of coal per annum. These sites are maintained under current mine leases as detailed in Table 3-1.

Development consent SSD-5144 was granted by the Planning & Assessment Commission (PAC) on 12 October 2015. As per Condition 13 of Schedule 2 of SSD-5144 and agreed with the Secretary of the Department of Planning & Environment (DPE), on 16 September 2016 in accordance with Section 104A of the Environmental Planning and Assessment Act 1979 (EP&A Act), Centennial Mandalong shall surrender DA97/800 by 30 September 2022.

A Notice of Consent Surrender was submitted by Centennial Mandalong to the DPE (via the major project portal) on 10 August 2022. The Department notified Centennial Mandalong on 29 August 2023 that DA97/800 had been voluntarily surrendered pursuant to section 4.63 of the *Environmental Planning and Assessment Act 1979* and section 68 of the *Environmental Planning and Assessment Regulation 2021*.

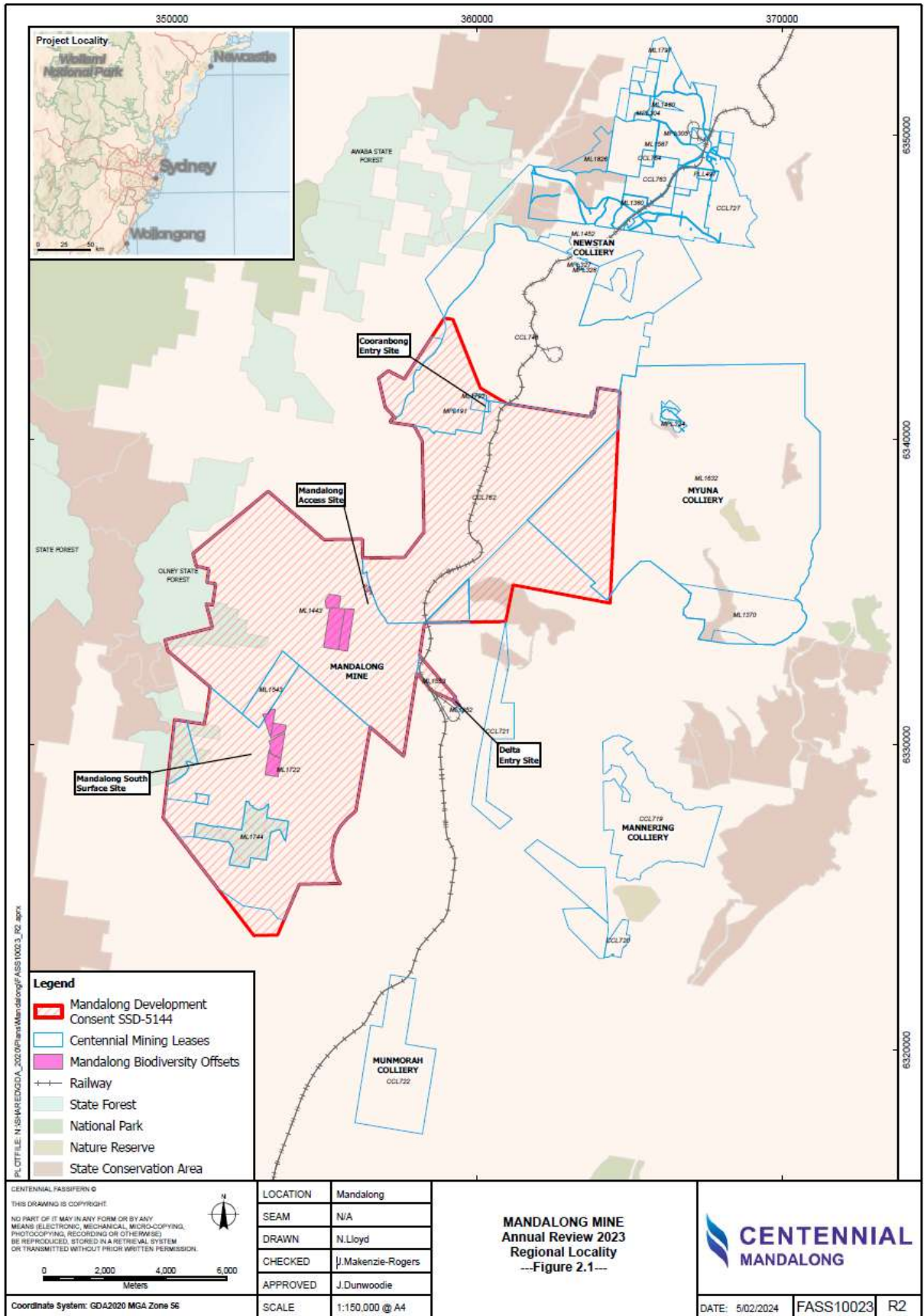


Figure 2-1: Regional Context

## 2.1 Scope

This Annual Review details the progress of environmental management covering Mandalong Mine, Mandalong South Surface Site, Cooranbong Entry Site and the Delta Entry Site collectively, for the period 1 January 2023 to 31 December 2023.

The Annual Review has been prepared in accordance with the Mandalong Mine conditions of consent as detailed in SSD-5144. The Annual Review has also been prepared in accordance with the requirements of Schedule 3, Condition 4 of DA35-2-2004 (Mandalong Coal Delivery System – Delta Link Project).

Development Consent SSD-5145 (Northern Coal Logistic Project) was approved by the DPE on 29 September 2015. The approval consolidates the receipt, handling, processing and transport of run-of-mine coal from Centennial Coal's underground operations at Mandalong Mine, Newstan Colliery and Awaba Colliery.

This Annual Review document also addresses the requirements of Schedule 5, Condition 11 of SSD-5145 for the Cooranbong Entry Site (CES). The other operations covered by SSD-5145 are described in the Newstan Annual Review required by SSD-5145.

The Annual Review has been prepared in accordance with the Annual Review Guideline (DPIE, 2015).

## 2.2 Mine Contacts

The contact details for the personnel responsible for environmental management and community relations at Centennial Site are provided in **Table 2-1**.

**Table 2-1: Centennial Site Environmental Contact Details**

Name	Position	Phone
Craig Shales	Mine Manager	T: 02 4973 0912
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Jeffrey Dunwoodie	Environment & Community Superintendent	T: 02 4973 0947
		E: jeffrey.dunwoodie@centennialcoal.com.au
Clint Allen	Approvals Coordinator	T: 02 4973 0948
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### 3 APPROVALS

A summary of Project Approvals, Mining Leases, and other Licences relevant to Centennial Site is provided in **Table 3-1**. Current Project Approvals, EPBC Approvals, Exploration Licences, and Mining Leases are available at <https://www.centennialcoal.com.au/operations/mandalong/>

**Table 3-1: Environmental Approvals held by Centennial Mandalong.**

Approval	Description	Expiry Date	Change to Approval during Reporting Period
<b>Project Approval – NSW Department of Planning and Environment</b>			
Mandalong Mine Development Consent No.97/800	Permits development and works to occur as described in the EIS.	October 2020	Surrender of DA97/800 completed on 29 August 2023.
Mandalong Mine Development Consent No. DA 35-2-2004	Permits construction and operation of the Delta Coal Handling Facility	31/12/2040	Nil
Mandalong Mine Development Consent SSD-5144	Extension of underground operations into the Mandalong Southern Extension Area.	31/12/2040	Nil
Centennial Northern Coal Services Development Consent SSD-5145	Receipt, handling, processing and transport of run-of-mine coal from Centennial Coal's underground operations at Mandalong Mine, Newstan Colliery and Awaba Colliery.	31/12/2045	Nil
<b>Extraction Plans – NSW Department to Planning and Environment</b>			
Extraction Plan LW30-31	Secondary extraction of LW30 and LW31	N/A	Nil
Extraction Plan LW32	Secondary extraction of LW32	N/A	Nil
Extraction Plan LW34	Secondary extraction of LW34	N/A	Nil

Approval	Description	Expiry Date	Change to Approval during Reporting Period
Extraction Plan LW57-60	Secondary extraction of LW57-60	N/A	Variation 1 - reduce length of Longwalls due to geological reasons.
<b>Environmental Protection Licence (EPL) – NSW Environment Protection Agency</b>			
EPL365	Permits scheduled activity “coal mining” and discharge of water from licensed discharge points.	Perpetual	Nil
<b>Radiation Licence – NSW Environment Protection Agency</b>			
Radiation Licence 5064217	Radiation management	26/6/2024	Nil
<b>Mining Lease – NSW Department of Regional NSW – Resources Regulator</b>			
Consolidated Coal Lease 762	Title to Cooranbong Workings includes some surface land, some environmental conditions	13/10/2043	Nil
Consolidated Coal Lease 746 (sublease)	Title for Cooranbong Workings includes some surface land – some environmental conditions (Managed by Centennial Newstan)	31/12/2028	Nil
Mining Purposes Lease 191	Title to surface land for water tanks at Cooranbong – requires annual environmental management report on anniversary	24/02/2044	Nil
Mining Lease 1443	Mandalong Project Mining Lease – includes some surface land	01/03/2043	Renewal of Mining Lease
Mining Lease 1543	Mining Lease – Mandalong Mine Project	25/11/2024	Application for Renewal submitted 26/10/2023.
Mining Lease 1553	Mining Lease Delta Link Project – includes surface land	07/09/2025	Nil



Approval	Description	Expiry Date	Change to Approval during Reporting Period
Mining Lease 1722	Mining Lease –Southern Extension Area	17/12/2036	Nil
Mining Lease 1744	Mining lease associated with proposed mining operations in the Olney State Forest areas within the Southern Extension Area	06/10/2037	Nil
Mining Lease 1793	Ancillary mining activities at the Cooranbong Entry Site.	16/07/2040	Nil
Mining Lease 1852	Ancillary mining activities at the Delta Entry Site	25/05/2044	Mining Lease Granted
<b>Exploration Licences – NSW Department of Regional NSW –Resources Regulator</b>			
Exploration Licence 4443	Exploration Licence	23/10/2025	Renewal of Exploration Licence
Exploration Licence 4969	Exploration Licence	25/03/2026	Renewal of Exploration Licence
Exploration Licence 5892	Exploration Licence	31/07/2017	Renewal Application Withdrawn, EL to be Relinquished
Exploration Licence 6317	Exploration Licence	17/03/2026	Renewal of Exploration Licence
Authorisation 404	Exploration Licence	31/07/2017	Renewal Application Withdrawn, EL to be Relinquished
<b>Environment Protection and Biodiversity Conservation – Commonwealth Department of Agriculture, Water and the Environment</b>			
Northern Coal Logistics EPBC Approval 2013/6906	To upgrade coal preparation, handling infrastructure, transport and water management activities at the existing Northern Coal Services Site	31/12/2055	Nil
<b>Water Licences – NSW Department of Planning, Industry and Environment – Water</b>			

Approval	Description	Expiry Date	Change to Approval during Reporting Period
Cooranbong Borehole WAL39767	Dewatering of Mine Workings	Water access licence continues to be in force until it is cancelled	Nil

### 3.1 ANNUAL REPORTING

Table 3-2 provides a checklist of reporting requirements and performance conditions addresses within the AR.

**Table 3-2: Annual Review Requirements**

Approval	Condition No	Requirement	Where addressed in Annual Review
SSD-5144	Schedule 6 Condition 12	By the end of March each year, or as otherwise agreed by the Secretary, the Applicant must submit a report to the Department reviewing the environmental performance of the development, to the satisfaction of the Secretary. This review must:	
		a) describe the development (including any rehabilitation) that was carried out in the last calendar year, and the development that is proposed to be carried out over the current calendar year;	<b>Section 3, Section 8 &amp; Section 12</b>
		b) include a comprehensive review of the monitoring results and complaints records of the development over the past calendar year, which includes a comparison of these results against the: <ul style="list-style-type: none"> <li>• relevant statutory requirements, limits or performance measures/criteria;</li> <li>• requirements of any plan or program required under this consent;</li> <li>• monitoring results of previous years; and</li> <li>• relevant predictions in the documents identified in condition 2(a) and (b) of Schedule 2;</li> </ul>	<b>Section 6, Section 7, &amp; Section 9.3.</b>
		c) Identify any non-compliance over the past calendar year, and describe	<b>Table 1-1, Table 1-2, &amp; Section 11.</b>



Approval	Condition No	Requirement	Where addressed in Annual Review
		what actions were (or are being) taken to ensure compliance;	
		d) identify any trends in the monitoring data over the life of the development;	<b>Section 6, Section 7, &amp; Section 9.3.</b>
		e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies;	<b>Section 6, Section 7, &amp; Section 9.3.</b>
		f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.	<b>Section 12</b>
SSD-5145	Schedule 5 Condition 11	By the end of March each year, or as otherwise agreed by the Secretary, the Applicant must submit a report to the Department reviewing the environmental performance of the development to the satisfaction of the Secretary. This review must:	
		a) describe the development (including any rehabilitation) that was carried out in the past calendar year, and the development that is proposed to be carried out over the current calendar year;	<b>Section 3, Section 8 &amp; Section 12</b>
		b) include a comprehensive review of the monitoring results and complaints records of the development over the past calendar year, which includes a comparison of these results against the: <ul style="list-style-type: none"> <li>• relevant statutory requirements, limits or performance measures/criteria;</li> <li>• requirements of any plan or program required under this consent;</li> <li>• monitoring results of previous years; and</li> <li>• relevant predictions in the documents identified in condition 2(a) of Schedule 2;</li> </ul>	<b>Section 6, Section 7, &amp; Section 9.3.</b>
		c) identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to ensure compliance;	<b>Table 1-1, Table 1-2, &amp; Table 11-1.</b>

Approval	Condition No	Requirement	Where addressed in Annual Review
		d) identify any trends in the monitoring data over the life of the development;	Section 6, Section 7, & Section 9.3.
		e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	Section 6, Section 7, & Section 9.3.
		f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.	Section 12
DA 35-2-2004	Schedule 3 Condition 1	The Applicant may incorporate any plan, audit or Annual Review required by this consent with the plans, audits or Annual Review required for the Mandalong Mine or any other adjoining operation in common ownership or under common management.	Noted.
	Schedule 3 Condition 4	By the end of March each year, or other timing as may be agreed by the Secretary, the Applicant must submit a report to the Department reviewing the environmental performance of the development, to the satisfaction of the Secretary. This review must:	
		a) provide monthly records of the amount of coal transported on the MCDS;	Table 4-1
		b) include a comprehensive review of the groundwater monitoring results of the development over the previous calendar year, which includes a comparison of these results against the: <ul style="list-style-type: none"> <li>• relevant statutory requirements, limits or performance measures/criteria;</li> <li>• requirements of any plan or program required under this consent;</li> <li>• monitoring results of years prior; and</li> <li>• relevant predictions in the documents listed in condition 2(a) of Schedule 2;</li> </ul>	Section 7.4
		c) evaluate and report on the compliance with the performance measures, criteria and operating conditions in this consent;	Section 6, Section 7, & Section 9.3.
		d) detail any non-compliance over the past calendar year, and describe what actions were (or are being)	Table 1-1, Table 1-2, & Section 11.

Approval	Condition No	Requirement	Where addressed in Annual Review
		taken to rectify the non-compliance and avoid reoccurrence;	
		e) identify any trends in the monitoring data over the life of the development;	Section 6, Section 7, & Section 9.3.
		f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies;	Section 6, Section 7, & Section 9.3.
		g) describe the measures to be implemented over the current calendar year to improve the environmental performance of the development; and	Section 12.
		h) be prepared in accordance with the Department's <i>Annual Review Guideline (2015)</i> .	Noted.

### 3.1.1 Centennial Mandalong Security Arrangements

A summary of the status of the Mandalong security arrangements held by the Department of Planning & Environment required under SSD-5144 is provided in **Table 3-3**.

**Table 3-3: Status of Mandalong Security Arrangements**

Project Approval	Relevant Condition	Security Required	Bank Guarantee Reference	Notes
Mandalong Mine Extension (SSD-5144)	Schedule 3, Condition 20. Conservation Bond	\$388,385	BG Ref: GI75002200080	Issued and provided to DPE 5 December 2022 for \$388,385

## 4 OPERATIONS SUMMARY

Details of production and associated waste generated by the site for the report period and next reporting is provided in **Table 4-1**.

**Table 4-1: Production Summary & Forecast**

Material	Approved Limit (and source)	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Next Reporting Period (Forecast)
Waste Rock/ Overburden	N/A			
ROM Coal	6.5 MTPA	2,782,153 TPA	1,833,746 TPA	2,047,613 TPA
Coarse reject	N/A			
Fine reject (Tailings)	N/A			
Saleable product	6.5 MTPA	2,680,812 TPA	1,459,947 TPA	1,663,509 TPA

### 4.1 OTHER OPERATIONS

**Table 4-2: Operations Summary**

	Approved Limit	Previous Reporting Period (Actual)	This Reporting Period (Actual)	Comment
Hours of operation	24/7	24/7	24/7	
Transport (rail)	N/A		N/A	
Product to Vales Point PS	4 MTPA	644,040 TPA	313,352 TPA	
Mandalong to Cooranbong	6 MTPA	2,146,212 TPA	1,520,393 TPA	
Product to Eraring PS	6 MTPA	813,458 TPA	144,964 TPA	
Cooranbong to Newstan for Washing	6 MTPA	1,332,754 TPA	1,375,429 TPA	

There were no inconsistencies between the approved limit and actual production for the reporting period.

**Table 4-3: Coal Processing, Handling and Transport Summary**

<b>Month</b>	<b>Product to Vales Point PS (4 Mtpa limit)</b>
January 2023	84,398
February 2023	44,711
March 2023	43,803
April 2023	42,546
May 2023	970
June 2023	881
July 2023	5163
August 2023	4909
September 2023	0
October 2023	14,886
November 2023	28,739
December 2023	42,346
<b>Total 2023 CY</b>	<b>313,352</b>

## **4.2 EXPLORATION**

During the period January 2023 to December 2023 eleven surface exploration boreholes were completed by Centennial Mandalong. All boreholes are rehabilitated in consultation with the landowner following drilling. Applications for additional exploration drilling will be ongoing as potential sites are identified and landowner access obtained.

## 5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

**Table 5-1** summarises the outcomes of the 2022 Annual Review, including actions issued by Regulators.

**Table 5-1: Actions from Previous Annual Review**

Action Required	Requested By	Action Taken	Where addressed in Annual Review
Ensure all figures are of legible quality / resolution	DPE	Quality and resolution of figures has been improved.	All figures within the Annual Review.
Clarify if non-compliances were reported to NSW Planning or any other relevant agency.	DPE	Comment included regarding whether incidents were reported to other agencies.	<b>Table 11-1</b>

## 6 ENVIRONMENTAL PERFORMANCE

Centennial Mandalong implements an Environmental Management Strategy, including management plans, procedures and monitoring programs that provide a framework for managing environment and community risks and impacts. To measure compliance with site approvals and licences, Centennial Mandalong undertakes a comprehensive monitoring program. The environmental monitoring program is shown in Plans (CM00315b, CM00315c, CM00315d, CM00315f).

Condition 12 of Schedule 6 of SSD-5144, Condition 11 of Schedule 5 of SSD-5145 and Condition 4 of Schedule 3 of DA35-2-2004 require the presentation and discussion on all monitoring required under the Development Consents and other approvals. **Table 6-1** includes a summary of the monitoring required by the Development Consents, current status and report section in the Annual Review.

**Table 6-1: Summary of Monitoring Requirements**

Monitoring Type	Status	Report Section
Meteorological Monitoring	Ongoing	<b>Section 6.1</b>
Noise Monitoring	Quarterly monitoring	<b>Section 6.2</b>
Blast Monitoring	As required	<b>Section 6.3</b>
Air Quality Monitoring	Ongoing	<b>Section 6.4</b>
Independent Noise and Dust Monitoring	Not Requested	<b>N/A</b>
Greenhouse Gas reporting and abatement measures	Ongoing	<b>Section 6.4.10</b>
Biodiversity Monitoring	Ongoing	<b>Section 6.5</b>
Cultural Heritage Monitoring	Ongoing	<b>Section 6.6</b>
Surface Water Monitoring	Ongoing	<b>Section 7.2</b>
Groundwater Monitoring	Ongoing	<b>Section 7.4</b>
Rehabilitation Monitoring	Ongoing	<b>Section 8</b>

## 6.1 METEOROLOGICAL MONITORING

The total monthly rainfall data is shown below in **Table 6-2** and in **Figure 6-1**.

**Table 6-2: Rainfall at Mandalong Mine, Cooranbong Entry Site and the Mandalong South Surface Site for the Period January 2023 to December 2023.**

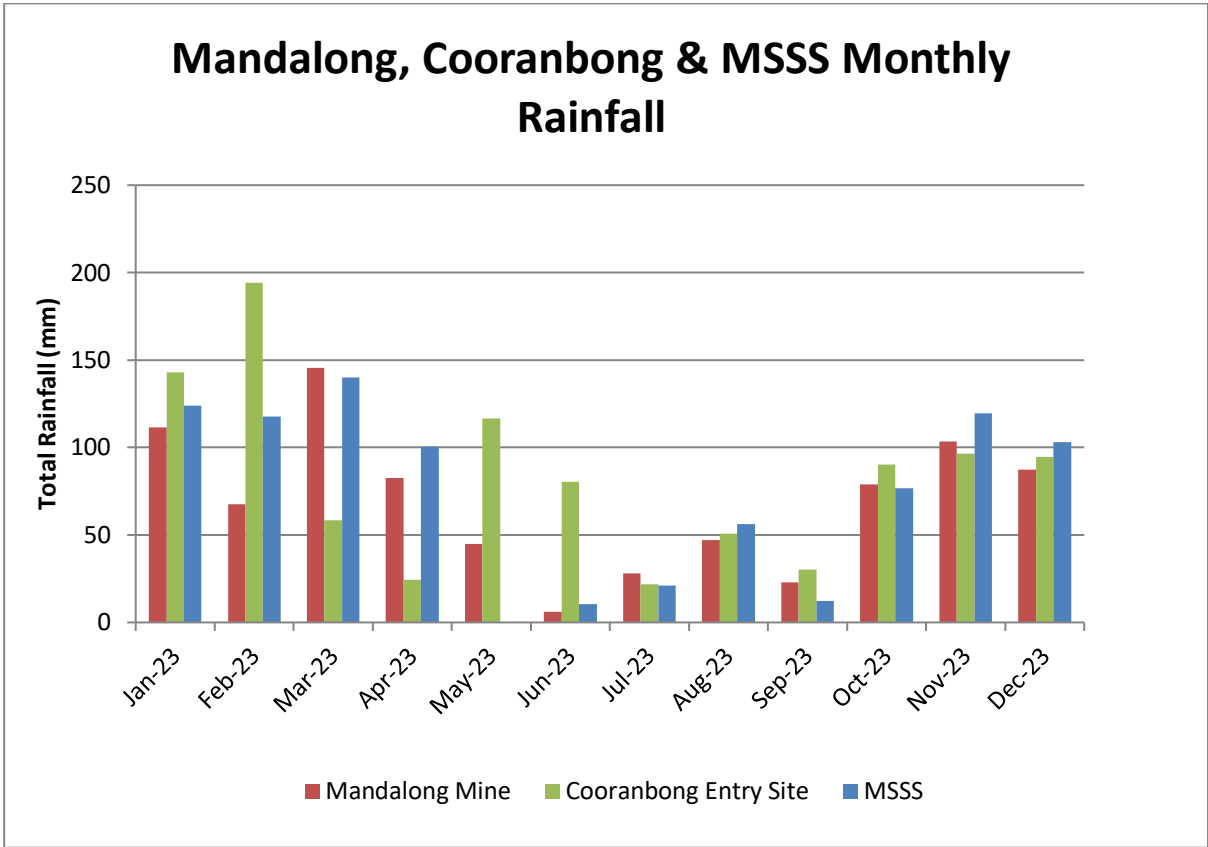
2023 Month	Mandalong Mine Total Rainfall (mm)	Cooranbong Entry Site Total Rainfall (mm)	Mandalong South Surface Site Total Rainfall (mm)
January	111.4	142.8	124
February	67.6	194.2	117.8
March	145.4	58.6	140.2
April	82.4	24.4	100.4
May	44.8	116.6	19.4
June	6.2	80.4	10.6
July	28	21.8	21
August	47.2	50.6	56.4
September	22.8	30.2	12.4
October	78.8	90.2	76.8
November	103.4	96.6	119.6
December	87.4	94.6	103
<b>Total</b>	<b>825.4</b>	<b>1001</b>	<b>901.6</b>

For Mandalong Mine, a total of 825.4 mm of rainfall was recorded at the site during the reporting period. The total annual rainfall for 2023 was lower than the annual average rainfall (1,124 mm) recorded at the Cooranbong Station (BOM station number 61012) from 1889 to 2016. The wettest monthly period in 2023 was March recording 145.4 mm.

For Cooranbong Entry Site, a total of 1,001 mm of rainfall was recorded at the site during the reporting period. The total annual rainfall for 2023 was lower than the annual average rainfall (1,124 mm) recorded at the Cooranbong Station (BOM station number 61012) from 1889 to 2016. The wettest recorded monthly period at the Cooranbong Entry Site in 2023 was February recording 194.2 mm.

For the Mandalong South Surface Site (MSSS), a total of 901.6 mm of rainfall was recorded at the site during the reporting period. The total annual rainfall for 2023 was lower than the annual average rainfall (1,124 mm) recorded at the MSSS Station (BOM station number 61012) from 1889 to 2016. The wettest recorded monthly period at the MSSS in 2023 was March recording 140.2 mm.





**Figure 6-1: Mandalong Mine, Cooranbong Entry Site & MSSS Monthly Rainfall**

## 6.2 NOISE MONITORING

Noise monitoring was conducted to assess operational noise levels compared to the noise limits specified by SSD-5144, SSD-5145 and EPL 365 in accordance with the requirements of the Northern Region Noise Management Plan (GHD, 2022d). The Mandalong Mine Noise Monitoring Program now requires Centennial Mandalong to survey noise from the operations at the Mandalong Mine and the Cooranbong Entry Site (shown in **Figure 6-2** and **Figure 6-3**) on a quarterly basis and at the Mandalong South Surface Site (**Figure 6-4**) on a monthly basis.

Measurements were conducted during typical worst-case operational conditions for both the Mandalong Mine and Cooranbong Entry Sites in order to capture associated typical worst-case noise emission levels. Noise monitoring during the construction of the Mandalong South Surface Site (MSSS) commenced in March 2017 on a quarterly basis, however from April 2022 until December 2023 monitoring has been undertaken on a monthly basis for operational activities in accordance with the Northern Region Noise Management Plan (GHD, 2022d). Monitoring for the MSSS will be undertaken on a quarterly basis in 2024.

The Mandalong Southern Extension Project Environmental Impact Statement (SLR, 2013) described the results of operational noise modelling for the Mandalong Mine Access Site and indicated that the relevant intrusive and amenity noise criteria will be achieved at all the nearest sensitive receivers. The noise impact assessment completed as part of the Northern Coal Logistics Project Environmental Impact Statement (SLR, 2014) predicted that operational noise levels at the Cooranbong Entry Site will meet the project-specific noise criteria at all nominated residential locations.

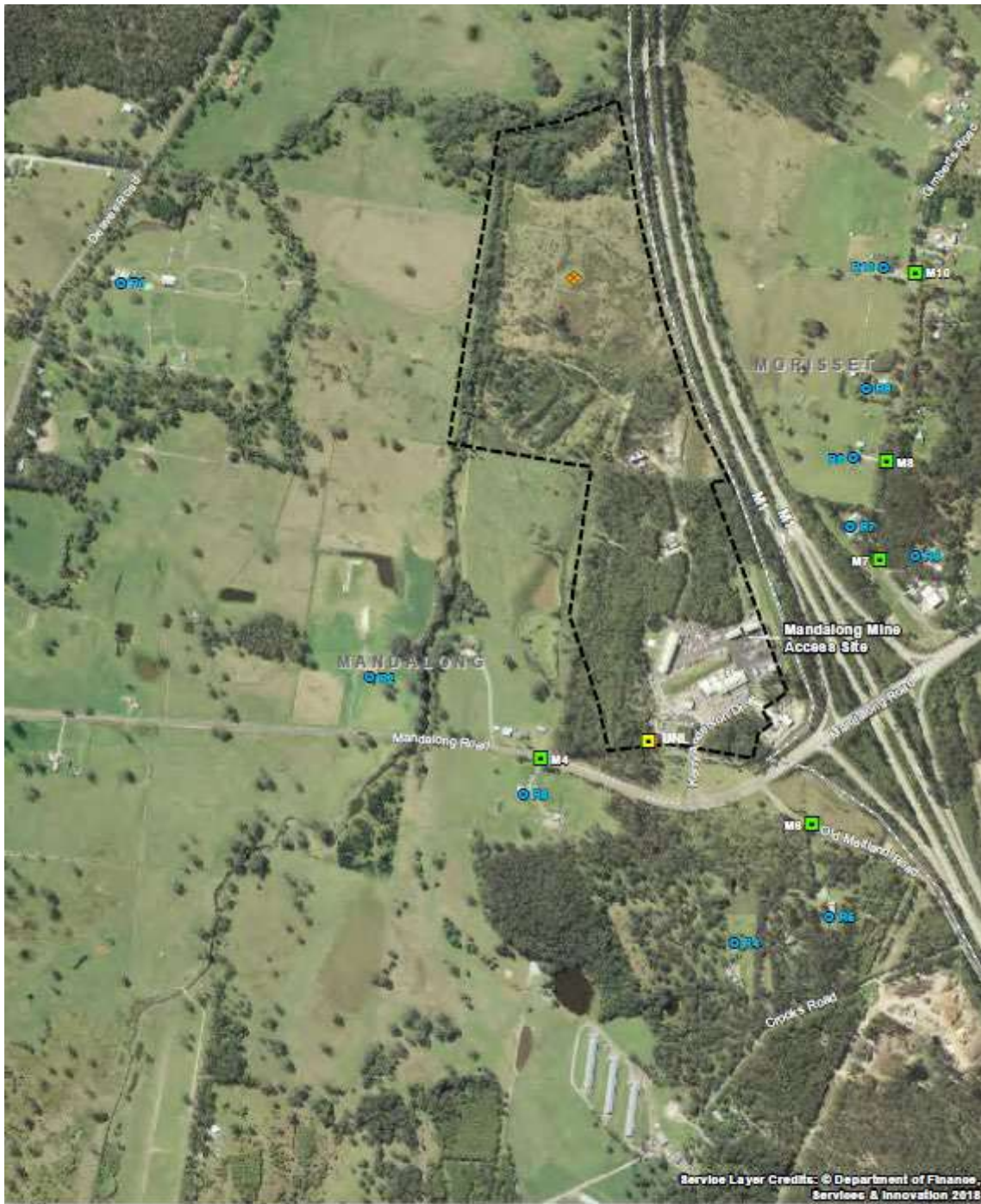


Figure 6-2: Mandalong Mine Noise Monitoring Locations





<p>1:25,000 for A4</p> <p>0 80 160 320 480 640 800</p> <p>Meters</p> <p>MAG Projection: Universal Transverse Mercator Horizontal Datum: Geoidetic Datum of Australia 1984 Grid: Map Grid of Australia, Zone 56</p>						<p><b>LEGEND</b></p> <ul style="list-style-type: none"> <li> Site boundary</li> <li> Suburb</li> <li> Noise unattended</li> <li> MET station</li> <li> Noise attended</li> <li> Noise unattended</li> <li> Sensitive receiver</li> </ul>	
<p>© 2021. All the maps used have been taken to prepare this map. Centennial Coal Company Limited and GHD (GHD) CORPORATION, shall not be responsible or liable for any errors, omissions or liability for any and/or damage and/or consequential loss and/or responsibility of any kind whether in contract, tort or otherwise, for any numbers, losses, damages or other costs (including interest or consequential damages) which are or may be incurred by any party as a result of the map being reviewed, accepted or available in any way and for any reason.</p>		<p>LOCATION -</p> <p>DRAWN TM</p> <p>CHECKED AR</p> <p>APPROVED</p> <p>SCALE refer to scalebar</p>		<p>Centennial Coal Mandalong Quarterly Noise Monitoring Noise sensitive receivers and monitoring locations - Cooranbong Entry Site</p>			
		DATE 6/05/2021		Figure 4-2			

Figure 6-3: Cooranbong Entry Site Noise Monitoring Locations



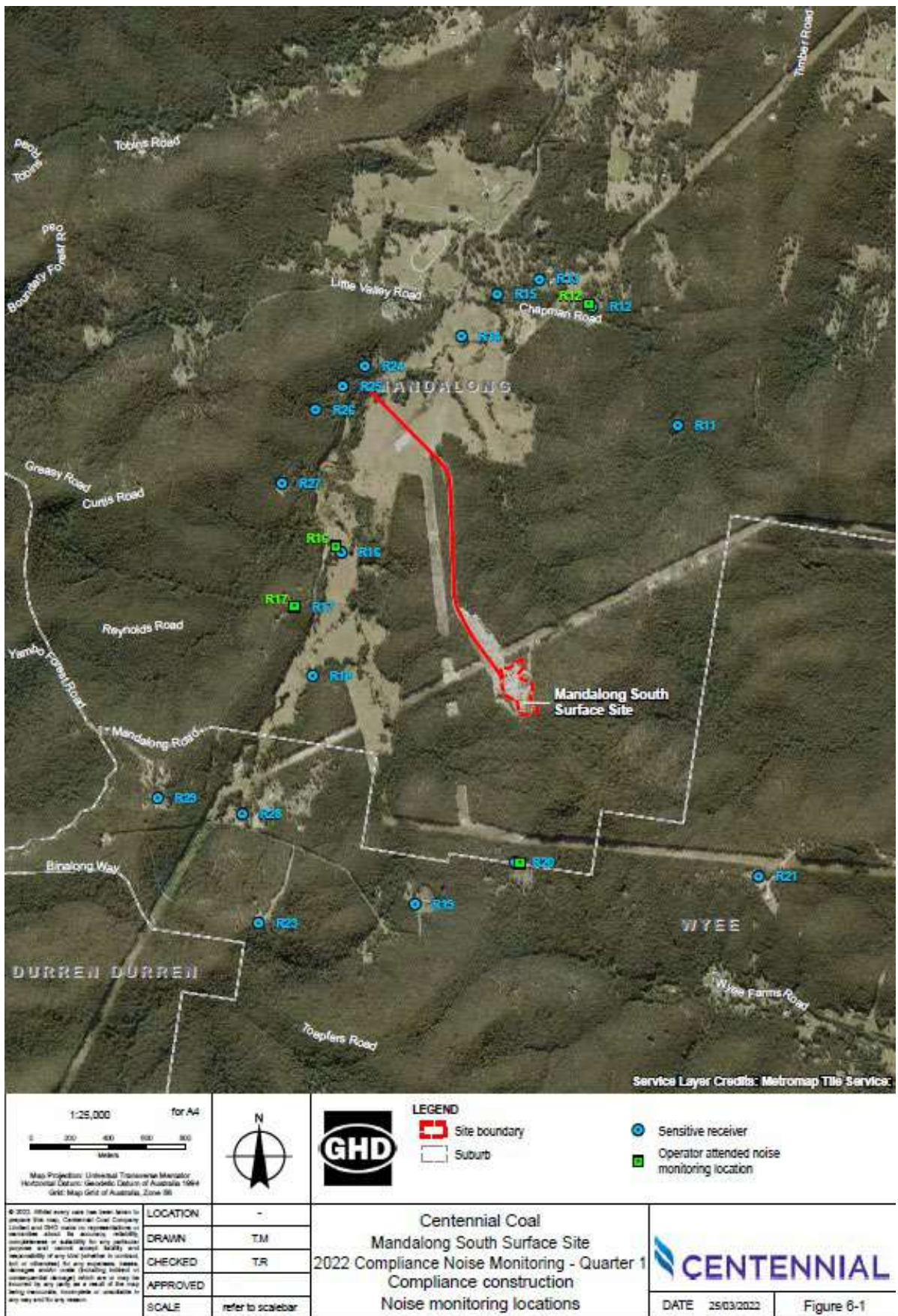


Figure 6-4: MSSS Noise Monitoring Locations

## 6.2.1 Environmental Performance

### 6.2.1.1 Attended Noise Monitoring – Mandalong Mine & Cooranbong Entry Site

GHD was engaged by Centennial Mandalong to conduct noise compliance assessments for the Mandalong Mine and Cooranbong Entry Site in accordance with the Northern Region Noise Management Plan (GHD, 2022d).

Operator attended noise measurements for the quarterly operator attended noise surveys were conducted on 20 March 2023, 29-30 June 2023, 4-5 September 2023 and 14 December 2023 at each of the six locations specified in the Noise Management Plan during the night-time period for 15 minutes. **Table 6-3** below compares the results of the operator attended noise monitoring with relevant noise goals.

**Table 6-3: Noise Monitoring Results Summary 2023**

Location	Q1	Q2	Q3	Q4	Criteria Limit
<b>Night (LAeq (15 minute) dBA)</b>					
M1	Not discernible	37	36	Not discernible	37
M4	Not discernible	<25	Not discernible	<25	42
M6	Not discernible	36	32	Not discernible	41
M7	Not discernible	Not discernible	Not discernible	Not discernible	43
M8 <sup>#</sup>	Not discernible	40	Not discernible	N/A	43
M10 <sup>#</sup>	Not discernible	37	Not discernible	N/A	39
<b>Night (LA1 (1 minute) dBA)</b>					
M1	Not discernible	37	37	Not discernible	45
M4	Not discernible	48	Not discernible	Not discernible	52
M6	Not discernible	<b>65</b>	57	51	61
M7	Not discernible	Not discernible	Not discernible	Not discernible	61
M8 <sup>#</sup>	Not discernible	40	Not discernible	N/A	61
M10 <sup>#</sup>	Not discernible	37	Not discernible	N/A	61

# Residences at monitoring locations M8 and M10 no longer exist. Construction works are currently occurring across this location for an expansion to the Morisset industrial area.

The attended quarterly operational noise monitoring showed that the noise contributions from the Mandalong Mine and Cooranbong Entry Site comply with the EPL 365, SSD-5144 and SSD-5145 noise criteria at all monitoring locations, with the exception of the sleep disturbance criteria at monitoring location M6 during the night-time period on 30 June 2023 (Q2).

The monitoring conducted by GHD at monitoring location M6 at 12:02am on Friday 30 June 2023 recorded a 5dBa exceedance of the SSD-5144 and EPL 365 sleep disturbance criteria (LA1 (1 minute)). The noise monitoring conducted by GHD, identified the source of the noise exceedance as being due to a single event of horn noise associated with a man transport vehicle at the Mandalong Mine Access Site. The horn noise occurred once and was considered as an outlier by GHD. Horn blasts are required as an on-site safety measure for all vehicles when entering and exiting the Mandalong Mine Access Site underground portal.

The GHD monitoring report for Q2 2023 concluded that since the short-term external noise levels were equal to or below 66 dBA (annoyance plus distance corrected noise level), the measured exceedances are not likely to affect health and wellbeing significantly. The existing acoustic environment at location M6 is already exposed to maximum noise level events higher than Mandalong Mine. The existing M1 road traffic noise levels measured at location M6 were between L<sub>Amax</sub> 66 to 69 dBA.

Centennial Mandalong requires that operators of vehicles use their horn once when entering and exiting the underground portal. This measure is implemented as on-site safety measure for all vehicles to prevent vehicle collisions. The internal review of the CCTV footage from 12.02am on 30 June 2023 has confirmed that the driver of the vehicle entering the MMAS portal used the horn for two seconds in accordance with the vehicle collision prevention measures required at the site.

Personnel at the Mandalong Mine Pit Top will continue to implement the collision control measures when entering and exiting the drift, for 1-2 seconds only to minimise off-site noise impacts.

There were no community complaints received by Centennial Mandalong in relation to the noise criteria exceedance. There have not been any noise related complaints in relation to the MMAS operations since 2011, with no previous complaints received regarding vehicle horn noise.

#### 6.2.1.2 Mandalong South Surface Site

GHD was engaged by Centennial Mandalong to conduct noise compliance monitoring for the operational activities at the Mandalong South Surface Site in accordance with the Northern Region Noise Management Plan (GHD, 2022d). The noise monitoring network locations at the Mandalong South Surface Site are shown in **Figure 6-4**. Since April 2022, noise monitoring has been undertaken monthly at the Mandalong South Surface Site.

Operator attended noise measurements were conducted on 17 January 2023, 7 February 2023, 20 March 2023, 26 April 2023, 29 May 2023, 29 June 2023, 24 July 2023, 21 August 2023, 4 September 2023, 23 October 2023, 14 November 2023 and 14 December 2023. The noise assessment consisted of attended monitoring to quantify construction noise levels at four noise sensitive receivers (R12, R16, R17 and R20) near the Mandalong South Surface Site. **Table 6-4** below compares the results of the operator attended noise monitoring with relevant noise goals.

**Table 6-4: MSSS Noise Monitoring Results Summary 2023**

Location	R12	R16	R17	R20
<b>Day (L<sub>Aeq</sub> (15 minute) dBA)</b>				
<b>January 2023</b>	Not discernible	31	32	Not discernible
<b>February 2023</b>	Not discernible	29	28	Not discernible
<b>March 2023</b>	34	34	30	Not discernible
<b>April 2023</b>	Not discernible	28	28	Not discernible
<b>May 2023</b>	29	<25	Not discernible	30
<b>June 2023</b>	Not discernible	<25	<25	<25
<b>July 2023</b>	27	31	30	Not discernible
<b>August 2023</b>	Not discernible	30	34	Not discernible

<b>September 2023</b>	Not discernible	31	32	27
<b>October 2023</b>	Not discernible	26	27	Not discernible
<b>November 2023</b>	Not discernible	28	29	Not discernible
<b>December 2023</b>	Not discernible	Not discernible	Not discernible	Not discernible
<b>Evening (LAeq (15 minute) dBA)</b>				
<b>January 2023</b>	Not discernible	28	27	Not discernible
<b>February 2023</b>	Not discernible	29	29	Not discernible
<b>March 2023</b>	28	30	29	28
<b>April 2023</b>	Not discernible	30	28	Not discernible
<b>May 2023</b>	29	25	25	29
<b>June 2023</b>	Not discernible	Not discernible	<25	27
<b>July 2023</b>	<25	31	28	Not discernible
<b>August 2023</b>	Not discernible	31	30	Not discernible
<b>September 2023</b>	Not discernible	30	29	28
<b>October 2023</b>	Not discernible	26	26	Not discernible
<b>November 2023</b>	Not discernible	27	27	Not discernible
<b>December 2023</b>	Not discernible	Not discernible	Not discernible	Not discernible
<b>Night (LAeq (15 minute) dBA)</b>				
<b>January 2023</b>	Not discernible	27	28	Not discernible
<b>February 2023</b>	Not discernible	29	29	Not discernible
<b>March 2023</b>	28	29	29	26
<b>April 2023</b>	Not discernible	28	26	Not discernible
<b>May 2023</b>	27	25	24	30
<b>June 2023</b>	Not discernible	Not discernible	Not discernible	Not discernible
<b>July 2023</b>	29	28	27	Not discernible
<b>August 2023</b>	Not discernible	27	27	27
<b>September 2023</b>	Not discernible	28	28	28
<b>October 2023</b>	Not discernible	25	28	Not discernible
<b>November 2023</b>	Not discernible	27	25	Not discernible
<b>December 2023</b>	Not discernible	Not discernible	<25	Not discernible
<b>Criteria Limit</b>	<b>35</b>	<b>35</b>	<b>35</b>	<b>35</b>

The results of the Mandalong South Surface Site 2023 noise monitoring indicates that operational noise levels were below the relevant noise management levels at the assessment monitoring locations R12, R16, R17 and R20.



In 2022, Centennial Mandalong developed an action plan following the completion of noise investigations and progressed with noise mitigation options for the MSSS ventilation fans. The design, manufacture and installation of three new outlet silencers for Fans 1, 2 and 3 was completed in October 2023.

Noise monitoring of the MSSS operations will continue in 2024 on a quarterly basis.

## **6.3 BLAST MONITORING**

### **Mandalong**

There was no blasting carried out at the Mandalong Mine in 2023.

### **Delta and Cooranbong Entry Sites**

There was no blasting carried out at the Delta and Cooranbong Entry sites during 2023.

## 6.4 AIR QUALITY MONITORING

SSD-5144 Schedule 3 Condition 8 and SSD-5145 Schedule 3 Condition 7 provide criteria for dust deposition cumulative impact and incremental impact. The cumulative impact is the increase in concentrations due to the development plus background concentrations. The cumulative impact is recorded as an annual monthly average and must not exceed 4g/m<sup>2</sup>/month. The incremental impact is the increase in concentrations due to the development alone. The incremental impact calculation is the monthly average minus the pre-construction average (PCA) recorded as an annual monthly average and must not exceed 2g/m<sup>2</sup>/month.

The location description for each depositional dust gauge is provided in **Table 6-5**.

**Table 6-5: Description of Depositional Dust Gauges**

Dust Gauge No.	Locality
D4	41 Gradwells Road Dora Creek (near Cooranbong Entry Site)
D6	Mandalong Mine Site Eastern Boundary (Near Sediment Basin)
D8	West of main front entrance (Mandalong Site)
D9	184 Mandalong Road
D10	202 Mandalong Road West of Mandalong Mine
D12	Mandalong South Surface Site
D14	North of Mandalong South entrance road (near wetland)

### 6.4.1 Mandalong Mine

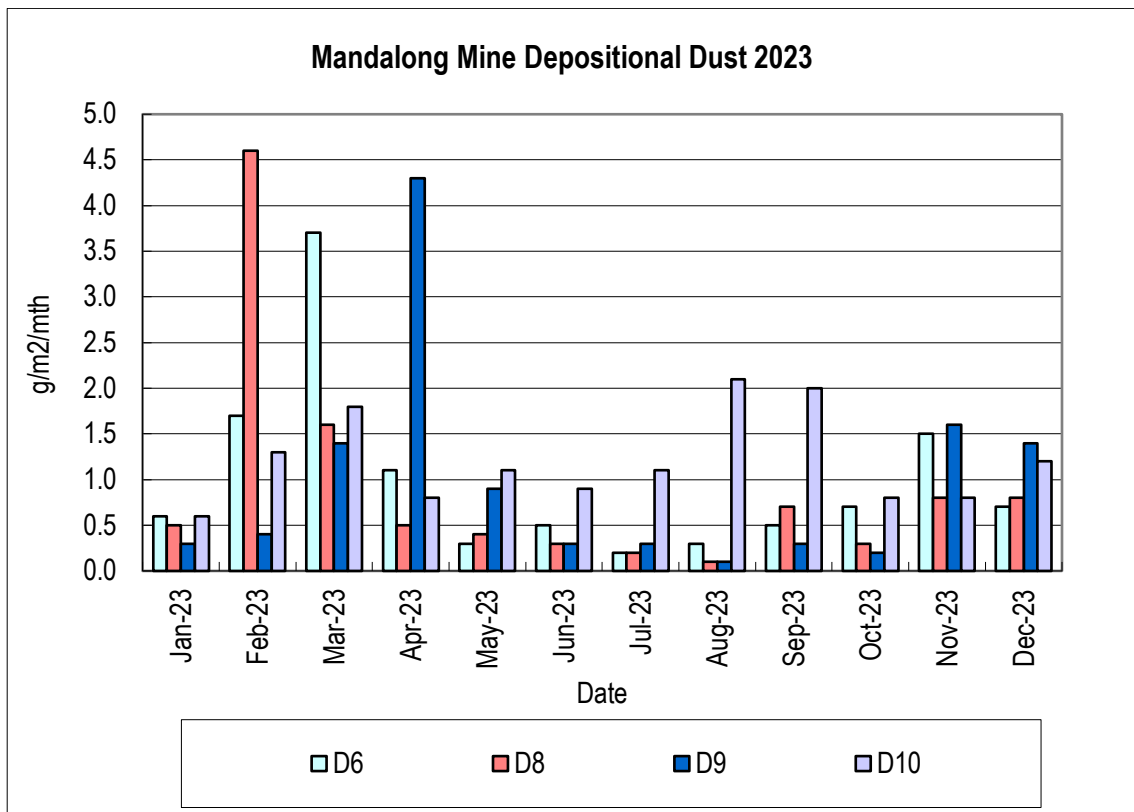
Depositional dust monitoring results are shown in **Table 6-6**. The results are presented as:

- Long-term average (all data since the commencement of monitoring at its present location - September 1999 to present);
- Annual Average during the report period (January 2023 to December 2023); and
- Pre-construction average (PCA) (September 1999 to August 2000).

**Table 6-6: Summary of depositional dust results between January 2023 and December 2023 surrounding Mandalong Mine.**

	Insoluble Solids (Combustible Matter + Ash) g/m <sup>2</sup> /month			
	DG6	DG8	DG9	DG10
<b>Long Term Average</b>	1.3	0.7	1.1	1.6
<b>Annual Average (2023 Reporting Period)</b>	1	0.9	1	1.2
<b>Pre-Construction Average</b>	0.8	0.8	0.9	*
<b>Limit Criteria</b>	4.0	4.0	4.0	4.0

\* Not available. Dust gauges installed after commencing construction.



**Figure 6-5: Monthly Depositional Dust Results 2023 Mandalong Mine**

The cumulative impact result is shown in **Table 6-7** and **Table 6-8** as an annual average. All dust gauges were compliant with the condition for the reporting period. The maximum cumulative impact was 1.28 recorded at DG6. The incremental impact result is shown in **Table 6-7** as the change from PCA. All dust gauges were compliant with the condition for the reporting period. The maximum incremental impact for DG6 is 0.5, DG8 is 0.3 and DG9 is 0.0.

**Table 6-7: Detailed Dust Monitoring and Analysis showing the Annual Rolling Average and Change in Deposition from the Pre-construction Average (PCA) for Dust Gauges DG6, DG8 and DG9.**

Date	DG6			DG8			DG9		
	Monitored Dust	Annual Average	Change from PCA	Monitored Dust	Annual Average	Change from PCA	Monitored Dust	Annual Average	Change from PCA
23/01/2023	0.6	1.04	0.2	0.5	0.68	-0.1	0.3	0.26	-0.6
23/02/2023	1.7	1.13	0.3	<b>4.6</b>	1.00	0.2	0.4	0.27	-0.6
24/03/2023	3.7	1.28	0.5	1.6	1.07	0.3	1.4	0.37	-0.5
24/04/2023	1.1	0.96	0.2	0.5	0.40	-0.4	<b>4.3</b>	0.29	-0.6
23/05/2023	0.3	1.17	0.4	0.4	1.10	0.3	0.9	0.73	-0.2
22/06/2023	0.5	1.12	0.3	0.3	1.10	0.3	0.3	0.75	-0.2
24/07/2023	0.2	1.04	0.2	0.2	1.05	0.3	0.3	0.75	-0.2
24/08/2023	0.3	0.99	0.2	0.1	1.05	0.2	0.1	0.74	-0.2
22/09/2023	0.5	0.98	0.2	0.7	1.08	0.3	0.3	0.75	-0.2
20/10/2023	0.7	0.95	0.2	0.3	1.04	0.2	0.2	0.75	-0.2
20/11/2023	1.5	0.97	0.2	0.8	0.96	0.2	1.6	0.85	0.0
21/12/2023	0.7	0.96	0.2	0.8	0.88	0.1	1.4	0.94	0.0

**Table 6-8 Detailed Dust Monitoring and Analysis showing the Annual Rolling Average for Dust Gauge 10**

Date	DG10		
	Monitored Dust	Annual Average	Change from PCA
23/01/2023	0.6	0.94	N/A
23/02/2023	1.3	1.00	N/A
24/03/2023	1.8	1.06	N/A
24/04/2023	0.8	0.81	N/A
23/05/2023	1.1	1.08	N/A
22/06/2023	0.9	1.10	N/A
24/07/2023	1.1	1.05	N/A
24/08/2023	2.1	1.15	N/A
22/09/2023	2.0	1.17	N/A
20/10/2023	0.8	1.17	N/A
20/11/2023	0.8	1.11	N/A
21/12/2023	1.2	1.13	N/A

#### 6.4.2 Cooranbong Entry Site

The Cooranbong Colliery Life Extension Project EIS predicted that dust emissions from the operational phase of the Cooranbong Preparation Plant were unlikely to cause a dust nuisance due to the distance to sensitive receptors (Umwelt, 1997). The Cooranbong Distribution Project EA (GSS Environmental, 2012) and the Northern Coal Logistics Project EIS (March 2014) modelling predictions for dust deposition also show that incremental and cumulative annual average dust deposition rates are predicted to be well below the impact criteria of 2g/m<sup>2</sup>/month and 4g/m<sup>2</sup>/month (assuming a background rate of 1.2 g/m<sup>2</sup>/month) at the nearest surrounding residences.

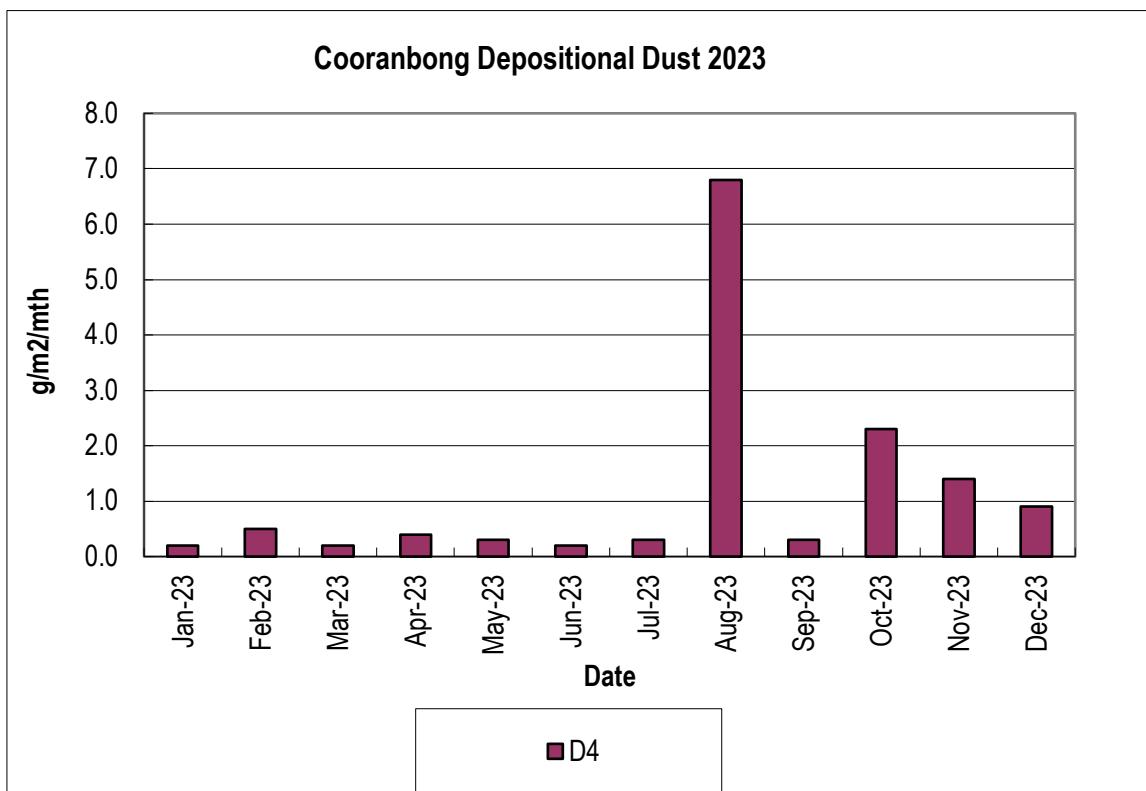
Annual average depositional dust results for 2023 and the LTA are provided in [Table 6-6](#) and [Table 6-7](#). The complete monthly dust monitoring data is provided in [Figure 6-6](#).

The cumulative impact result for DG4 is shown in [Table 6-10](#) as an annual average. DG4 was compliant with the condition for the report period. The maximum cumulative impact was 1.08.

The incremental impact result for DG4 is shown in [Table 6-10](#) as the change from PCA. DG4 was compliant with the condition for the reporting period. The maximum incremental impact for DG4 is -0.1.

**Table 6-9: Summary of Depositional Dust Results between January 2023 and December 2023 surrounding the Cooranbong Entry Site.**

	Insoluble Solids (Combustible Matter + Ash) g/m <sup>2</sup> /month
	<b>DG4</b>
Long Term Average	1.2
Average 2023 (Reporting Period)	1.2
Limit criteria (annual average)	4.0



**Figure 6-6: Monthly Depositional Results 2023 CES**

**Table 6-10 Detailed Dust Monitoring and Analysis showing the Annual Rolling Average and Change in Deposition from the Pre-construction Average (PCA) for Dust Gauge 4**

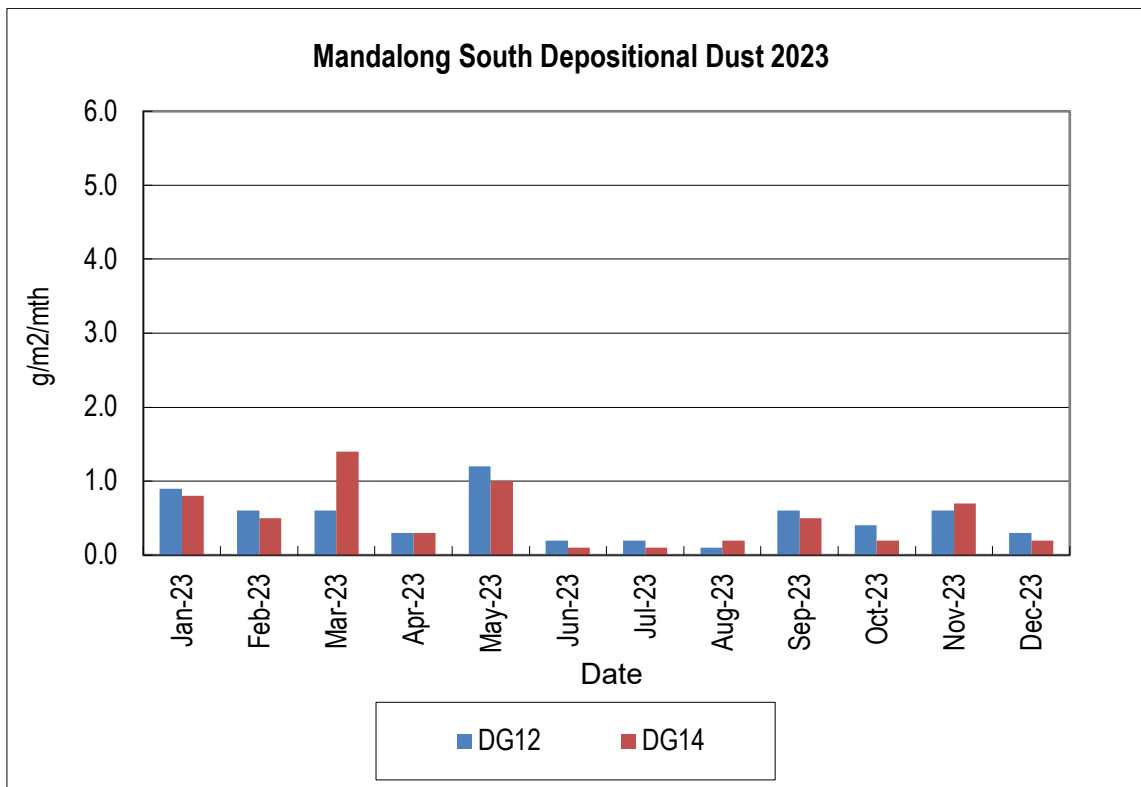
Date	DG4		
	Monitored Dust	Annual Average	Change from PCA
23/01/2023	0.2	0.42	-0.8
23/02/2023	0.5	0.43	-0.8
24/03/2023	0.2	0.42	-0.8
24/04/2023	0.4	0.42	-0.8
23/05/2023	0.3	0.33	-0.9
22/06/2023	0.2	0.30	-0.9
24/07/2023	0.3	0.31	-0.9
24/08/2023	6.8	0.82	-0.4
22/09/2023	0.3	0.83	-0.4
20/10/2023	2.3	0.98	-0.2
20/11/2023	1.4	1.05	-0.1
21/12/2023	0.9	1.08	-0.1

### 6.4.3 Mandalong South Surface Site

Depositional dust gauges were installed at the Mandalong South Services Site in June 2014 for the purpose of pre-construction air quality monitoring. Construction of the Mandalong South Surface Site access road commenced in February 2017 and construction of the Surface Site commenced in July 2017. The monthly dust deposition results for DG12 and DG14 are provided in **Figure 6-7**. Annual average depositional dust results for 2023 and the consent criteria are provided in **Table 6-11**, **Table 6-12** and **Figure 6-7**.

**Table 6-11: Summary of Depositional Dust Results between January 2023 and December 2023 surrounding the Mandalong South Surface Site.**

	Insoluble Solids (Combustible Matter + Ash) g/m <sup>2</sup> /month	
	DG12	DG14
Long Term Average	0.7	1.5
Average 2023 (Reporting Period)	0.5	0.5
Limit Criteria	4.0	4.0



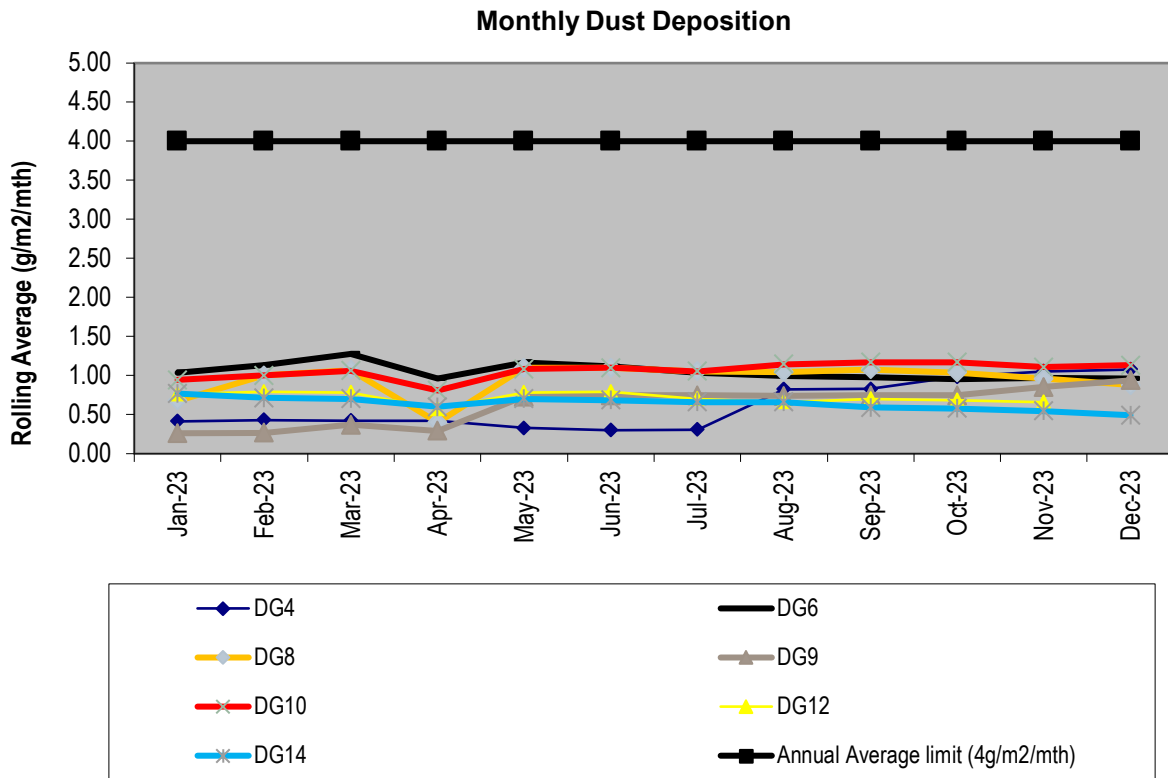
**Figure 6-7: Monthly Depositional Results 2023 MSSS**

The cumulative impact result is shown in **Table 6-12** as an annual average. The dust gauges were compliant with the condition for the reporting period. The maximum cumulative impact at DG12 was 0.79 and DG14 was 0.77. The incremental impact result is shown in **Table 6-12** as the change from PCA. The dust gauges were compliant with the condition for the reporting period. The maximum incremental impact for DG12 is 0.3 and DG14 is -0.8

**Table 6-12 Detailed Dust Monitoring and Analysis showing the Annual Rolling Average and Change in Deposition from the Pre-construction Average (PCA) for Dust Gauge DG12 and DG14**

Date	DG12			DG14		
	Monitored Dust	Annual Average	Change from PCA	Monitored Dust	Annual Average	Change from PCA
23/01/2023	0.9	0.76	0.3	0.8	0.77	-0.8
23/02/2023	0.6	0.79	0.3	0.5	0.72	-0.9
24/03/2023	0.6	0.78	0.3	1.4	0.70	-0.9
24/04/2023	0.3	0.58	0.1	0.3	0.60	-1.0
23/05/2023	1.2	0.78	0.3	1.0	0.70	-0.9
22/06/2023	0.2	0.79	0.3	0.1	0.68	-0.9
24/07/2023	0.2	0.70	0.2	0.1	0.66	-0.9
24/08/2023	0.1	0.66	0.2	0.2	0.66	-0.9
22/09/2023	0.6	0.70	0.2	0.5	0.59	-1.0
20/10/2023	0.4	0.68	0.2	0.2	0.58	-1.0
20/11/2023	0.6	0.66	0.2	0.7	0.55	-1.1
21/12/2023	0.3	0.48	0.0	0.2	0.49	-1.1

**Figure 6-8 Dust Deposition Rolling Annual Average and Limit Criteria**



**6.4.4 Air Quality Monitoring Data Interpretation**



### ***Mandalong Mine***

All dust gauges recorded results below the dust deposition consent limit criteria of 4 g/m<sup>2</sup>/month for cumulative impacts and 2g/m<sup>2</sup>/month for incremental impacts. Dust levels at DG 6, 8 & 9 show minor or no variation to the pre-construction average, confirming that the activities had minimal impact on surrounding air quality in 2023 as predicted in the Mandalong Southern Extension Project EIS (SLR, 2013).

The annual average for each dust gauge is below or equal to the long-term average except for DG8. The greatest difference in averages was at DG8 which has a long-term average of 0.7 g/m<sup>2</sup>/month and recorded an annual average of 0.9 g/m<sup>2</sup>/month.

### ***Cooranbong Entry Site***

DG4 recorded results well below the dust deposition consent limit criteria of 4g/m<sup>2</sup>/month for cumulative impacts and 2g/m<sup>2</sup>/month for incremental impacts.

Average annual depositional dust results for DG4 are on average 0.6g/m<sup>2</sup>/month below the pre-construction average. Dust deposition levels at DG4 located at the nearest sensitive receivers and on the operational boundary at Cooranbong are below the pre-construction average, confirming that the Cooranbong operation had minimal impact on surrounding air quality in 2023 as predicted in the Cooranbong Colliery Life Extension Project EIS (Umwelt, 1997), the Cooranbong Distribution Project EA (GSS Environmental, 2012) and the Northern Coal Logistics Project EIS (SLR, 2014).

The annual average for DG4 for 2023 is equal to the long-term average.

### ***Mandalong South Surface Site***

DG12 and DG14 recorded results well below the dust deposition consent limit criteria of 4 g/m<sup>2</sup>/month for cumulative impacts and 2g/m<sup>2</sup>/month for incremental impacts.

Dust levels at DG12 show a slight increase above the pre-construction average and DG14 is below the pre-construction average, confirming that the activities had minimal impact on surrounding air quality in 2023 as predicted in the Mandalong Southern Extension Project EIS (SLR, 2013).

DG12 recorded an annual average similar to the long-term average. DG14 recorded an annual average lower than the long-term average.

#### **6.4.5 Particulate Matter**

Continuous dust monitoring was installed in June 2013 at the Cooranbong Entry Site to monitor total suspended particles (TSP) and particulate matter (PM10) as per the condition M2.2 of EPL365. The limit criterion for PM10 annual average concentrations was reduced to 25ug/m<sup>3</sup> when the Northern Coal Services consent SSD-5145 was approved 29<sup>th</sup> September 2015. The consent SSD-5145 requires that air quality impacts at the Cooranbong Entry Site do not exceed the limit criteria of:

- 90ug/m<sup>3</sup> annual average for TSP;
- 25ug/m<sup>3</sup> annual average for PM10; and
- 50ug/m<sup>3</sup> 24-hour average for PM10.

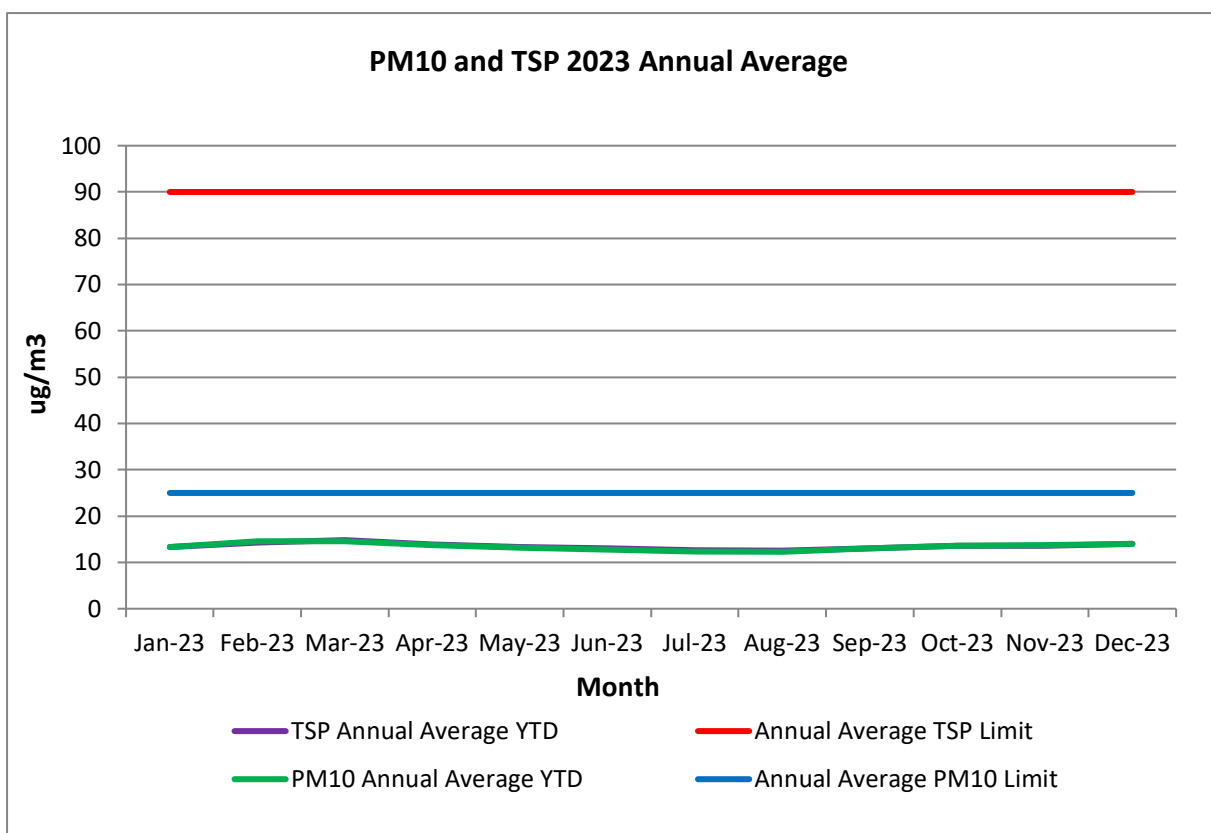
There were no exceedances of the PM10 and TSP annual average limit criteria for the reporting period. The 2023 annual average for PM10 was 14.07µg/m<sup>3</sup>. The 2023 annual average for TSP was 13.94µg/m<sup>3</sup>.

There were no exceedances of the 24-hr average PM10 concentration SSD-5145 24-hr criterion of 50µg/m3 in 2023.

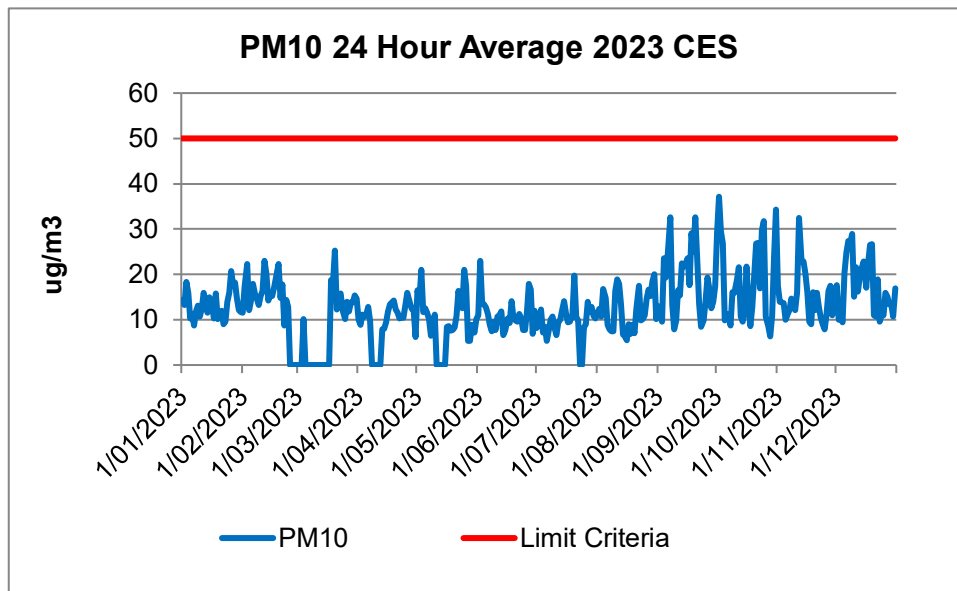
The maximum PM10 concentration of 37.13 µg/m<sup>3</sup> was recorded on 2 October 2023. The maximum TSP recording was 34.02 µg/m<sup>3</sup> which occurred on 2 October 2023. There is no maximum 24hr concentration limit for TSP.

#### 6.4.6 Air Quality Monitoring Data Interpretation

TSP and PM10 monitoring results are shown in **Figure 6-9**, **Figure 6-10**, **Figure 6-11** and **Figure 6-12**. The results are presented as an annual average for the reporting period (January 2023 to December 2023). The monitoring results for the TSP and PM10 annual and 24 hour average from January to December 2023 are in accordance with the predictions from the air quality impact assessment for the Cooranbong Distribution Project EA (GSS Environmental, 2012) and the predictions from the air quality impact assessment for the Northern Coal Logistics Project EIS (SLR, 2014).



**Figure 6-9: PM10 and TSP 2023 Annual Rolling Average and Limit Criteria**



**Figure 6-10: PM10 24 Hour Average 2023**

#### 6.4.7 HVAS (High Volume Air Samplers)

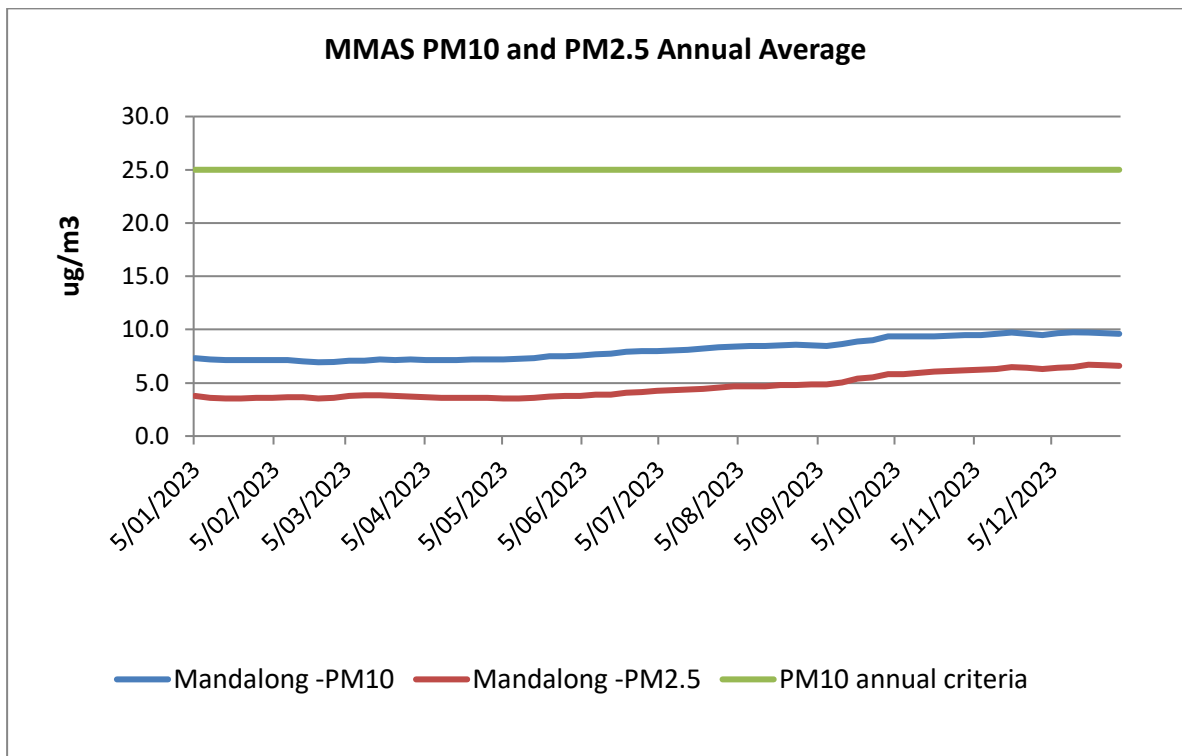
PM<sub>10</sub> and PM<sub>2.5</sub> high volume air samplers were installed in January 2014 at Mandalong to monitor fine particles from the Mandalong Mine Access Site. The limit criterion for PM<sub>10</sub> annual average concentrations was reduced from 30µg/m<sup>3</sup> to 25µg/m<sup>3</sup> with approval of Modification 6 of Consent SSD-5144 in April 2019. SSD-5144 requires that air quality impacts at the Mandalong Mine Access Site do not exceed the limit criteria of:

- 90µg/m<sup>3</sup> annual average for TSP;
- 25µg/m<sup>3</sup> annual average for PM<sub>10</sub>; and
- 50µg/m<sup>3</sup> 24-hour average for PM<sub>10</sub>.

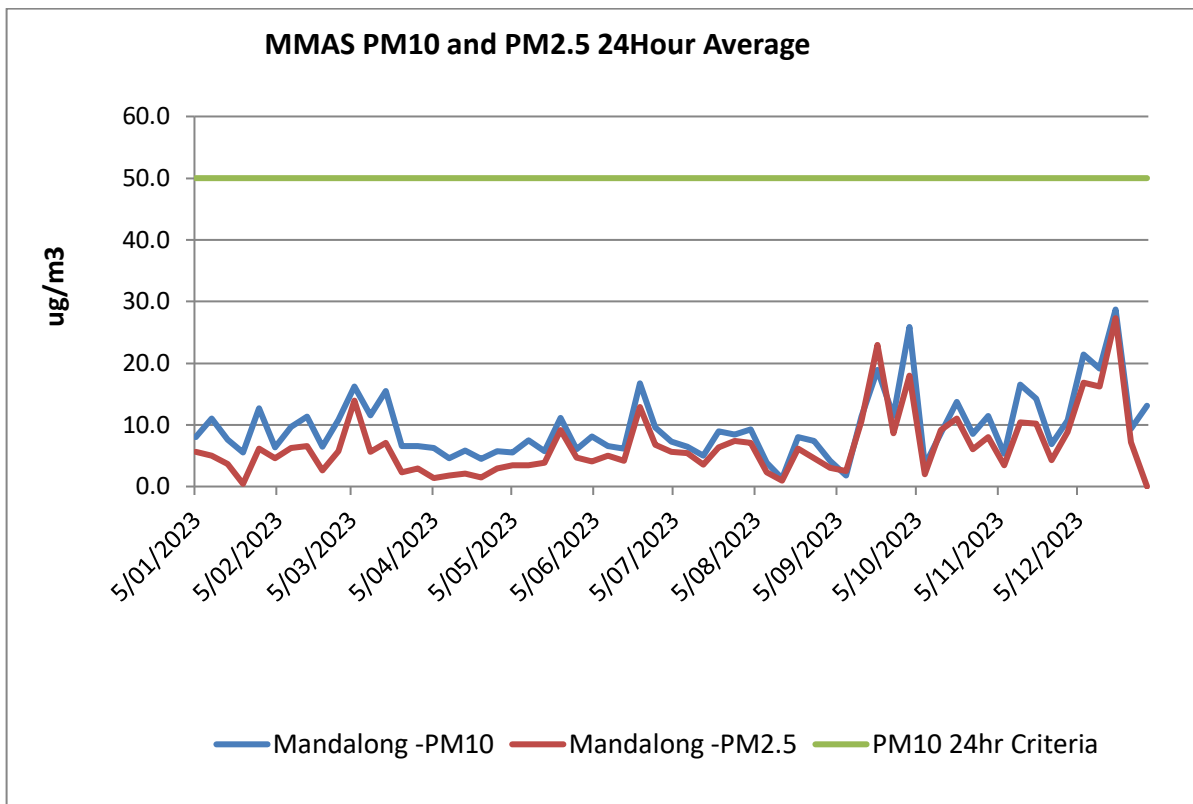
There were no exceedances of the PM<sub>10</sub> and TSP annual average limit criteria for the report period. The 2023 annual average for PM<sub>10</sub> was 9.60 µg/m<sup>3</sup>. The 2023 annual average for TSP was 10.90µg/m<sup>3</sup>. The annual average for TSP is calculated using the HVAS PM<sub>10</sub> data. The 2023 annual average for PM<sub>2.5</sub> was 7µg/m<sup>3</sup>.

The 24-hr average PM<sub>10</sub> concentrations recorded nil exceedances of the Development Consent SSD-5144 24-hr criterion of 50µg/m<sup>3</sup> in the 2023 monitoring period.

The maximum PM<sub>10</sub> concentration of 28.7µg/m<sup>3</sup> and TSP concentration of 32.5µg/m<sup>3</sup> were recorded on 19 December 2023. The maximum PM<sub>2.5</sub> concentration of 27.3µg/m<sup>3</sup> was recorded on 19 December 2023. There is no maximum 24hr concentration limit for TSP and PM<sub>2.5</sub>.



**Figure 6-11: MMAS PM10 and PM2.5 Annual Average Monitoring Results and Limit Criteria**



**Figure 6-12: MMAS PM10 and PM2.5 24Hour Average Monitoring Results and Limit Criteria**

#### 6.4.8 Air Quality Monitoring Data Interpretation

PM10 and PM2.5 monitoring results are shown in **Figure 6-11** and **Figure 6-12**. The results are presented as an annual average for the report period (January 2023 to December 2023). The monitoring results for the TSP and PM10 annual and 24-hour average from January to December 2023 are in accordance with the predictions from the air quality impact assessment for the Mandalong Southern Extension Project EIS (SLR, 2013).

#### 6.4.9 Greenhouse Gas Monitoring

In accordance with Centennial Coal's standard for GHG reporting the 2023 financial year (FY 1 July 2022 to 30 June 2023), emissions in CO2 equivalent tonnes (Co2-eT) as defined in the *National Greenhouse and Energy Reporting Act 2007* are provided in **Table 6-13**. **Table 6-13** also includes a comparison against the maximum annual emissions included in the Mandalong Southern Extension Project EIS (SLR, 2013). Total Scope 1 GHG emissions for the 2023 FY period were 1,009,855 CO2-eT, which is lower than the 2022 FY emissions of 1,471,834 CO2-eT.

The majority of Scope 1 emissions in 2023 were caused by fugitive methane contributing to 95.55% of all GHG emissions. Mandalong Mine is currently working towards GHG reduction measures to abate fugitive methane emissions. This is discussed further in Section 6.4.11.

During the 2023 financial year, Mandalong's Stage 1 Gas Flares abated 71.8% of the amount of mine waste gas captured in the drainage system. This resulted in 243,050 CO2-eT of abatement or the equivalent of 20.1% of the total fugitive emissions from the Mandalong Mine.

**Table 6-13: Total GHG Emissions from Mandalong Mine in 2023 Financial Year**

Emissions Summary (CO2-eT) July 2022 to June 2023	Total	EIS Maximum Annual Emissions (CO2-eT)
Diesel	4,352*	29,424#
Petroleum Based Oils and Greases (PBOG)	299	
SF6	6	
Coal Extraction (Fugitives)	964,963	1,703,872
Surface Fugitive - Post Mining	40,236	
<b>TOTAL Scope 1 Emissions</b>	<b>1,009,855</b>	<b>1,813,664</b>
<b>Electricity</b>	<b>62,085</b>	<b>107,152</b>
<b>TOTAL Scope 2 Emissions</b>	<b>62,085</b>	<b>107,152</b>

\* Includes Cooranbong Entry Site coal handling / haulage diesel combustion.

# Includes 24,144 Co2-eT for Cooranbong haul truck diesel consumption as per NCLP EIS

#### 6.4.10 Greenhouse Gas Abatement Investigations Measures

As reported in previous Annual Reviews, Centennial has invested in technologies to reduce fugitive methane GHG emissions from the Mandalong Mine. A four-stage process is planned to address this Greenhouse Abatement. Construction of Stage 1 and Stage 2 were completed in November 2013.

**Stage 1 Gas Flares** - A consent modification approval was obtained in 2005 to construct multiple enclosed flares planned to be used to reduce fugitive methane GHG emissions from the Mine's surface gas drainage plant. Civil works for construction of the gas flares commenced in October 2012, with final commissioning completed and automated operations commencing in November 2013. The construction of the enclosed gas flares has assisted with abating drainage gas emissions of up to 2,000 litre/sec flow rate.

**Stage 2 Ventilation Air Methane Regenerative After Burner (VAM RAB®)** - Approval for a modification to DA97/800 was sought in 2011, to allow for the installation and ongoing operation of a single VAM RAB® unit as a demonstration project to examine the performance capability. Approval was granted by the Planning Assessment Commission (PAC) on behalf of the Minister for the then Department of Planning and Infrastructure (DP&I) on 11 November 2011.

The VAM RAB® technology initially proposed for Mandalong includes installation and operation of a single VAM RAB® unit as part of a demonstration project to demonstrate capture and abatement of approximately 10 cubic metres per second (m<sup>3</sup>/s) of the mine's total Ventilation Air Methane (VAM). The VAM is low concentration methane in the mine ventilation stream and the VAM RAB® system overcomes this technical difficulty by directing the mine ventilation air into a large oxidation vessel, oxidising the methane into carbon dioxide. This technology is based on well tested coke-oven principles, utilised in the steel industry.

Civil construction works on the surface pad for the VAM RAB® unit commenced in December 2011 and were completed in November 2013. The VAM RAB® demonstration plant has been heated up on a number of occasions during the last six months of 2014, with some minor configuration changes made in 2015 and 2016.

The VAM RAB® plant is currently impacted by technical issues. From a technical perspective, refinements are required for the VAM RAB® to reach a suitable temperature profile to allow trial abatement of methane. Over the project life, a number of test procedures have been conducted resulting in significant changes to the design and structure of the plant. These have included a rebuild of the VAM RAB® core.

The current status of the Project is that it is on hold in its commissioning phase. It has not progressed to, or completed, the formal experiment Stage 1 (6-week VAM simulation) or Stage 2 (12 months on VAM).

**Stage 3 Gas Engines** - In July 2009 Mandalong Mine received approval from the then DP&I to construct and operate multiple methane gas engines to generate electricity. When the generation facility was implemented, power can be supplied to the site and excess power sold to the grid. The flare units will remain available as back-up or for peak gas flows.

In 2018, Centennial Mandalong commenced planning and design works for the Gas Engines project. Construction of the Gas Engines by EDL was completed in 2021, with commissioning completed in 2023. The Stage 3 Gas Engines are now in operation at the Mandalong Mine. These engines are owned and managed by EDL and are a separate facility under the NGER scheme.

**Stage 4** - Mandalong is currently investigating options to improve methane gas capture from the underground mine. This would then allow increased methane abatement through the Stage 1 Gas Flares or the Stage 3 Gas Engines. If the projects are viable, they are expected to commence in 2024 or 2025.

## 6.5 BIODIVERSITY MONITORING

Biodiversity Monitoring is undertaken at Mandalong in accordance with the relevant Extraction Plans (EP) and associated Biodiversity Management Plans (BMP). Table 6-14 provides a brief overview of the Extraction Plan Areas, when extraction was completed and when monitoring is expected to be completed.

**Table 6-14: Biodiversity Monitoring Timeframes for Extraction Plan Areas**

Extraction Plan Areas	Extraction Completion Date	Monitoring Completion Date
LW25-29	26 May 2021	04 November 2024
LW30-31	01 May 2022	04 November 2024
LW32	04 Nov 2022	04 November 2024
LW34	31 May 2023	31 May 2025
LW39-43	October 2028	TBC
LW57-58	December 2024	TBC

### 6.5.1 Longwall (LW) 25-29 Extraction Plan Area

The monitoring of sensitive environments subject to potential subsidence impacts is a requirement as per Schedule 4, Condition 6 of SSD-5144. This monitoring is to be performed in accordance with the relevant approved EP and associated BMP sub-plan. Approved BMPs for LW25-29 define the monitoring methods for threatened flora and Endangered Ecological Communities (EECs) that may be potentially influenced by subsidence-related impacts arising from the secondary extraction of LW25-29.

The baseline monitoring report was undertaken in 2018, with the current report prepared by RPS presenting results from the fourth and final annual monitoring effort in 2023. The 'impact area' for the monitoring program for LW25-29, as referred to in the 2023 report, is shown in **Figure 6-13**. The impact area is defined as the area within the LW25-29 boundary. Boundary changes have occurred throughout the duration of the project for various reasons. The 'previous area LW25-31' boundary was shortened due to an igneous sill that could not be undermined, with extraction to encompass LW25-29 only.

The 2023 monitoring results indicate that the mining of LW25-29 has not had a substantial negative impact on sensitive vegetation communities. Species richness within predicted impact plots and control plots was generally consistent between the baseline survey in 2018 and the monitoring year in 2023 for all three of the sensitive ecological communities. Although there were some slight decreases in species richness, these measures were also observed within control plots in 2023, suggesting differences amongst years are likely due to observer bias or natural processes. Moreover, changes in composition of understory species assemblages were negligible for those plots displaying lower richness scores in 2023, despite this stratum being the most likely to initially respond to any hydrological changes, such as those associated with mining-related ponding (RPS, 2024a).

There were no notable differences in BAM condition scores (composition, structure, function and vegetation integrity) between baseline (2018) and following completion of extraction

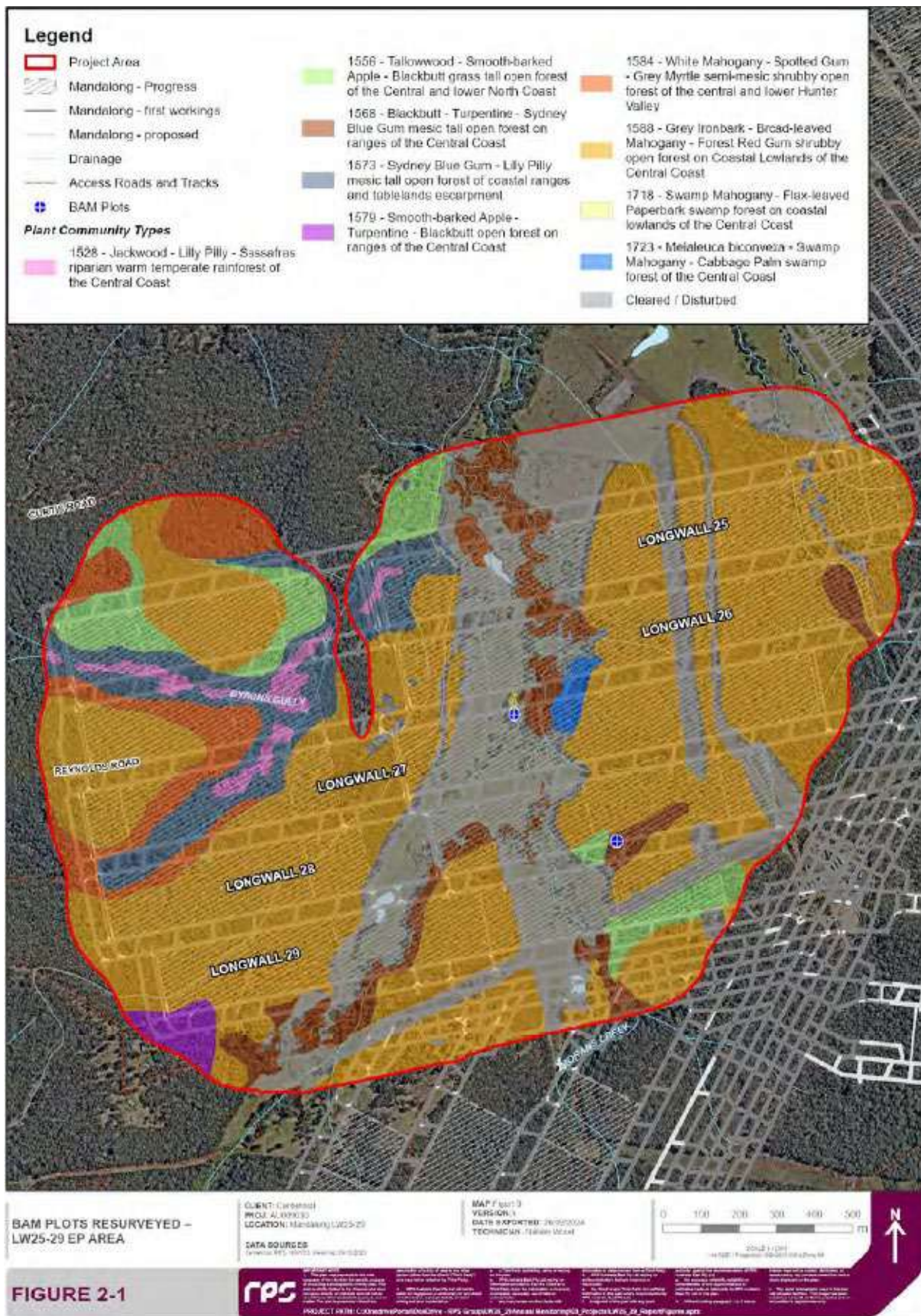
(2021). This suggests no detectable change in vegetation condition since commencement of LW25-29 extraction (RPS, 2024a).

During the 2023 survey campaign, only Plot 1 was monitored due to adjustments in the Monitoring Area. For this plot, there has been an increase in the total stem count of *Melaleuca biconvexa* (*M. biconvexa*) between the baseline and 2023. Although there has been a slight decrease in the number of saplings (0-150cm) and mature (301+cm) individuals in 2023, these age classes have generally remained stable since the baseline survey. This trend appears to be specific to this plot and not part of a broader pattern, as sapling recruitment has shown fluctuations over the survey years.

Observations of *Rhodamnia rubescens* (*R. rubescens*) within the Monitoring Area reveal distinct trends between impact and control plots. In impact plots, there has been a noticeable decline in saplings, although juvenile individuals continue to persist. This trend is supported by height and count measurements, which indicate an increase in average plant height but a decline in population count since the baseline assessment. Control plots have shown a decline in saplings but an increase in juvenile and mature populations. Generally, *R. rubescens* specimens in control plots exhibit greater height and maturity compared to those in impact plots (RPS, 2024a).

Despite comparable Myrtle Rust infection ratings between control and impact plots in 2023, the data suggests that impact plots may be more susceptible to population declines. This vulnerability could be attributed to the less established population of plants and the susceptibility of seedlings and saplings, as well as epicormic and coppice growth, to Myrtle Rust infection within the impact plots (RPS, 2024a).





Source: (RPS, 2024a)

Figure 6-13: Floristic Plots LW25-29 Sites

### 6.5.2 LW30-31 Extraction Plan Areas

A Biodiversity Monitoring Program (BMP) is required for Mandalong Mine LW30-31 under the Development Consent SSD-5144, as outlined in the LW30-31 Extraction Plan BMP (RPS 2020).

RPS have completed a 2023 monitoring report (RPS, 2024b) for LW30-31 which concerns the terrestrial biodiversity monitoring, which includes sensitive vegetation communities and threatened species (including threatened flora, amphibians, cave-associated microbats, and the brush-tailed rock wallaby).

Baseline monitoring efforts were undertaken by RPS in 2019 and 2020, with data collected in 2021 onwards representing the initial survey effort following the extraction within the LW30-31 EP Area. Accordingly, the 'impact area' for the monitoring program for LW30-31 is defined as the area within the LW30-31 EP Area boundary (as shown in **Figure 6-14**). At the time of the RPS surveys (September 2023), extraction of both longwalls was completed.

Baseline surveys were undertaken by RPS prior to mining in 2019 and 2020 to initiate the monitoring of sensitive vegetation communities and habitat condition. This monitoring occurred at impact and control sites with the data collected referred to as 'before' data. This data was used to characterise the likely variation in these communities for future post mining comparisons.

The 2023 survey campaign focused on resurveying all plots within the LW30-31 EP Area. This included plots in the EP Area where increases in ponding are predicted due to mining to date (i.e. predicted impact plots), plots in the EP Area outside of areas where increases in ponding are expected or in areas not subject to mining to date (i.e. non-predicted impact plots) and corresponding control plots (in an area away from impacts from mining).

The 2023 survey suggests that mining of LW30-31 has not had a substantial negative impact on sensitive vegetation communities. Species richness within predicted impact plots and control plots was generally consistent or decreased between the baseline surveys (2019/2020) and 2023 (post-mining) for all of these sensitive ecological communities (RPS, 2024b).

Despite a general decrease in species richness within undermined plots, equally lower richness measures in control plots in 2023 suggest differences amongst years are likely due to observer bias or broader influences (e.g., climatic shifts). Moreover, changes in composition of understory species assemblages were negligible for those plots displaying lower richness scores in 2023, despite this stratum being the most likely to initially respond to any hydrological changes, such as those associated with mining related ponding.

There were no notable differences in BAM condition scores (composition, structure, function and vegetation integrity) between baseline measures in 2019/2020 and following completion of extraction of LW30-31 in 2023. This suggests no detectable change in vegetation condition since completion of LW30-31 extraction (RPS, 2024b).

Monitoring of *R. rubescens* within the EP Area reveals a nuanced picture: while there has been a decline in *R. rubescens* saplings in impact plots, juvenile individuals continue to persist. This observation is supported by height and count measurements, which indicate an increase in average plant height but a decrease in population count since the baseline. Similar declines in saplings have been noted in control plots, but there have been notable increases in juvenile and mature populations. Notably, *R. rubescens* plants in control plots tend to be taller and more mature compared to those in impact plots.

Although Myrtle Rust infection ratings are comparable between control and impact plots in 2023, impact plots may be more susceptible to population declines. This vulnerability arises because impact plots harbor a less established population of plants and seedlings, and saplings, as well as epicormic and coppice growth, are particularly susceptible to Myrtle Rust infection.

It's important to highlight that Impact Plot 2 experienced a reduction in the population size compared to the initial survey. This decline was primarily caused by the excessive growth of

*Lantana camara* within the plot, potentially outcompeting or inhibiting the growth of smaller size classes (RPS, 2024b).

Three patches of *Corybas dowlingii* (*C. dowlingii*) also known as Red Helmet Orchid were established in August 2021 within the LW30-31 EP Area. These locations were resurveyed in 2023. The count of individuals has increased in control plots and remained stable in impact plots between 2021 and 2023. The percent cover of *C. dowlingii* has decreased in both control and impact plots since 2022. However, it's important to note that cover values are susceptible to a high degree of observer bias and should ideally correlate with the count of individuals. Therefore, cover analysis may not be the most reliable variable for indicating plant health. Plant health scores have remained unchanged in both control and impact plots since 2021. Ongoing monitoring, considering broader climatic cycles such as ENSO, is necessary to determine if any observed changes in local threatened flora populations are linked to subsidence-related impacts (RPS, 2024b).

*Genoplesium insigne* (*G. insigne*) was first opportunistically recorded in the EP area in 2022, and monitoring surveys are undertaken by means of parallel transect through known habitat to record population count. The *G. insigne* population has increased between 2022 and 2023 (RPS, 2024b)

No threatened frogs were detected during surveys conducted in summer during baseline (2019 and 2020) or post-mining (2021 and 2022). In 2023, Frog species richness has increased since baseline, with a total of 12 in impact plots and 15 in control plots. Of note, *Mixophyes iteratus* or Giant barred frog (Endangered under the BC Act and Vulnerable under the EPBC Act) was recorded for the first time in the control area. This suggests that amphibian species are continuing to persist within the riparian habitats of LW30-31.

Microbat diversity increased since 2020 and remained stable from 2022 to 2023. A potential roost for *Rhinolophus megaphyllus* (Horseshoe bat) was identified in the EP Area, where it has been frequent since 2020. Three threatened microbat species were recorded: *Chalinolobus dwyeri* (Large-eared pied bat), *Miniopterus australis* (Little bent-wing bat), and *Saccolaimus flaviventris* (Yellow-bellied sheath-tailed bat). However, their call frequencies didn't suggest nearby roosting. Additionally, two new species, *Austronomus australis* (White-striped free-tailed bat) and *Saccolaimus flaviventris*, were found in both EP and control areas.

No *Petrogale penicillata* (Brush-tailed Rock Wallaby) were detected by camera trap in either the impact area (i.e., LW30-31 EP Area) or control sites in the Olney State Forest.

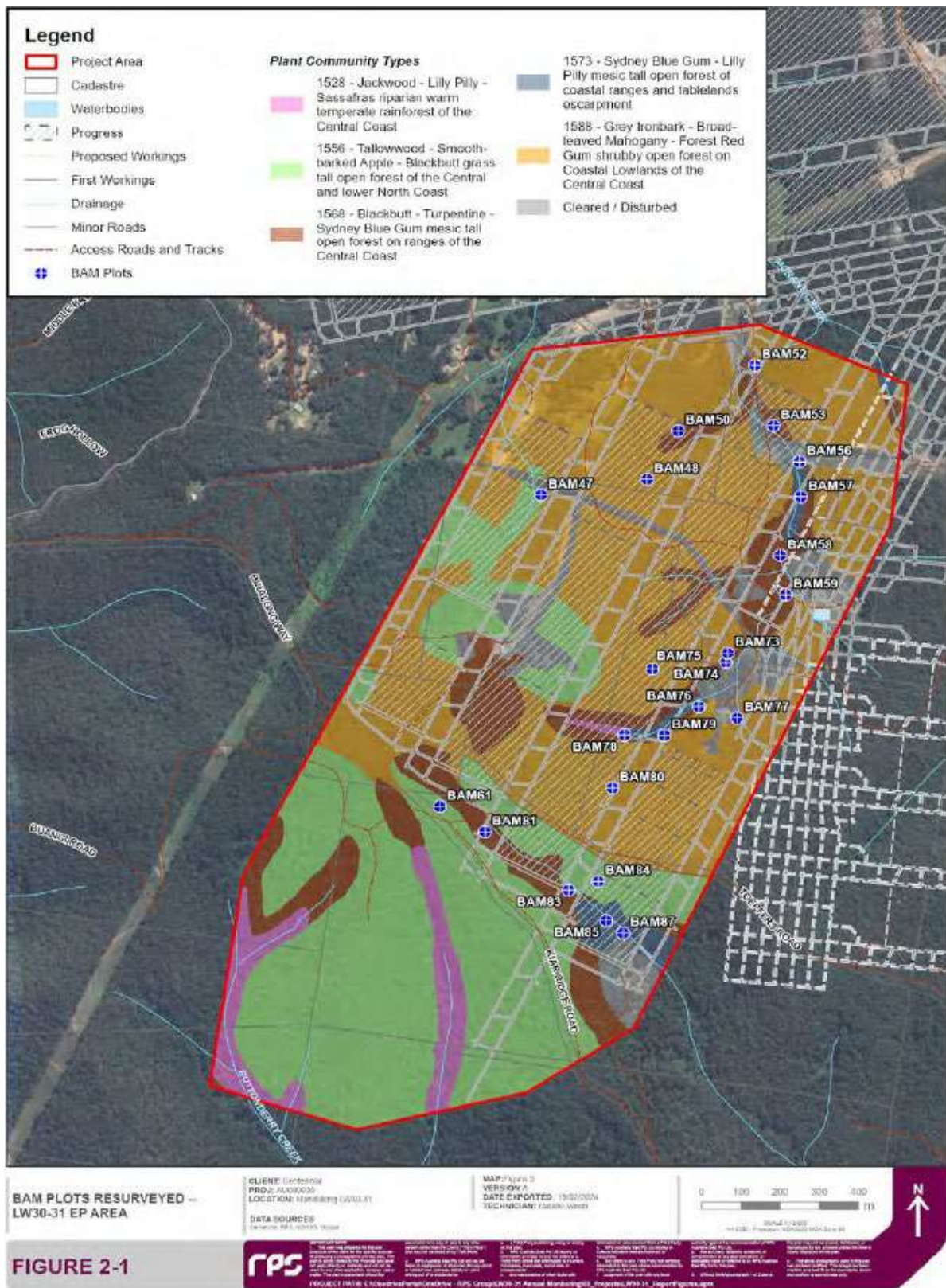
RPS (2024b) have presented the results for the 2023 biodiversity monitoring event for the LW30-31 EP area. Biodiversity data collected during 2023 was compared to baseline data (i.e., collected in 2019 and 2020), and data collected in 2022 to determine if a non-negligible impact to biodiversity outcomes has occurred since commencement of mining, as required by the consent conditions for Schedule 4 Condition 6(j) of SSD-5144.

No non-negligible changes were detected for the following measured biodiversity outcomes:

- Sensitive ecological communities;
- Threatened species: *R. rubescens* and *C. dowlingii*;
- Threatened amphibians; or
- Threatened cave-associated microbats

As per the above summary, a TARP under the LW30-31 BMP was not triggered. Monitoring is to continue until biodiversity monitoring can be finished two years after completion of mining in the adjacent longwall panel in sensitive environments (which includes floodplains and Groundwater Dependent Ecosystems (GDEs)) (RPS, 2024b).





Source: (RPS, 2024b)

Figure 6-14: Floristic Plots LW30-31 Sites

### 6.5.3 LW32 Extraction Plan Area

A Biodiversity Monitoring Program (BMP) is required for Mandalong Mine LW32 under the Development Consent SSD-5144, as outlined in the LW32 Extraction Plan BMP.

RPS have completed a 2023 monitoring report for LW32 which concerns the terrestrial biodiversity monitoring, which includes sensitive vegetation communities and threatened species (including threatened flora, amphibians, cave-associated microbats, and the brush-tailed rock wallaby).

Baseline monitoring was conducted in 2020 and 2021, with data collected in 2022 serving as the initial survey following extraction within this EP Area. The data collected in 2023 represents the second set of monitoring results for LW32. Accordingly, the 'impact area' for the monitoring program for LW32 is defined as the area within the LW32 EP Area boundary (as shown in **Figure 6-15**). At the time of RPS surveys (Spring 2023), extraction of both longwalls was completed.

From the 2023 results, (RPS, 2024c) suggest that mining of LW32 has not had a substantial negative impact on sensitive vegetation communities. Species richness within both predicted impact plots and control plots was generally decreased between the baseline survey (2020/2021), the 2022 survey and the subsequent monitoring year in 2023 for both of the sensitive ecological communities. This suggests differences amongst years are likely due to observer bias or broader influences (e.g., climatic shifts).

There were no notable differences in BAM condition scores (composition, structure, function and vegetation integrity) between baseline measures in 2020/2021 and following completion of extraction of LW32 in 2022.. This suggests no detectable change in vegetation condition since completion of LW32 extraction (RPS, 2024c).

Three patches of *C. dowlingii* (Red Helmet Orchid) (1 predicted impact, 2 control) were surveyed throughout 2023. Count of individuals has increased in control plots and remained stable in impact plots between 2021 and 2023. Percent cover of *C. dowlingii* has decreased in both control and impact plots since 2022, however core values are subject to a high degree of observer bias and should generally correlate with count of individuals, therefore cover analysis may not be the most reliable variable to indicate plant health. Plant health scores have not changed in control or impact plots since 2021 Ongoing monitoring, encompassing a broader climatic cycle (e.g., ENSO) is required to determine if any detected changes in local threatened flora populations are attributed to subsidence-related impacts (RPS, 2024c).

In 2023, surveys targeting habitat for threatened amphibians in LW32 were unable to be completed due to changes in property access (RPS, 2024c). Additionally, technical malfunctions prevented the recording of any data from Anabat Units deployed within the LW32 EP Area (RPS, 2024c).

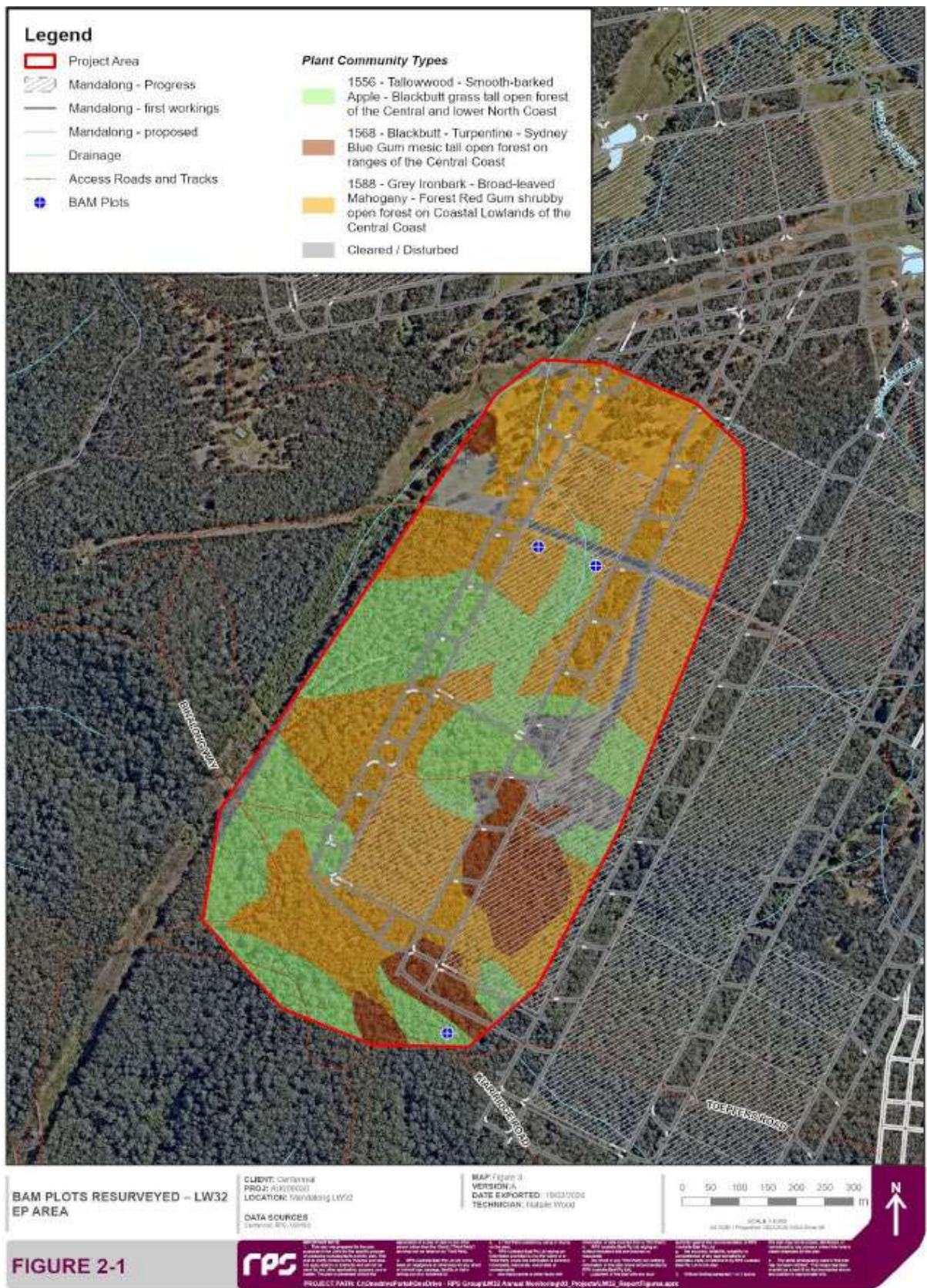
RPS (RPS, 2024c) have reviewed the biodiversity data collected during 2023 and compared to baseline data (i.e., collected in 2020 and 2021), and data collected in 2022, to determine if a non-negligible impact to biodiversity outcomes has occurred since commencement of mining, as required by the consent conditions for Schedule 4, Condition 6(j) of SSD-5144.

No non-negligible changes were detected for the following measured biodiversity outcomes:

- Sensitive ecological communities; and
- Threatened species: *C. dowlingii*

As per the above summary, a TARP under the LW32 BMP was not triggered. Monitoring is to continue until biodiversity monitoring can be finished two years after completion of mining in the adjacent longwall panel in sensitive environments (which includes floodplains and GDEs) (RPS, 2024c).





Source: (RPS, 2024c)

Figure 6-15: Floristic Plots LW32 EP Sites

#### 6.5.4 LW34 Extraction Plan Area

A Biodiversity Monitoring Program (BMP) is required for Mandalong Mine LW34 under the Development Consent SSD-5144, as outlined in the LW34 Extraction Plan BMP.

RPS have completed a 2023 monitoring report for LW34 which concerns the terrestrial biodiversity monitoring, which includes sensitive vegetation communities and threatened species (including threatened flora, amphibians, cave-associated microbats, and the brush-tailed rock wallaby) (RPS, 2024).

Baseline monitoring was conducted in 2019 and 2020 as part of the adjacent LW30-31 EP Area, with further baseline data collected in 2021 following confirmation of the LW34 EP Area. The data collected in 2023 onwards represents survey efforts following extraction in these areas. Accordingly, the 'impact area' for the monitoring program for LW34 is defined as the area within the LW34 EP Area boundary (as shown in **Figure 6-16**). At the time of RPS surveys (Spring 2023), extraction of the longwall was completed.

From the 2023 results, (RPS, 2024) suggest that mining of LW34 has not had a substantial negative impact on vegetation communities. Species richness and BAM condition scores within both predicted impact plots and control plots was generally decreased between the baseline survey (2020/2021), the 2022 survey and the subsequent monitoring year in 2023 for both of the sensitive ecological communities. This suggests differences amongst years are likely due to observer bias or broader influences (e.g., climatic shifts).

Monitoring within the EP Area reveals trends in *R. rubescens*: saplings in impact plots decreased since the baseline but showed an increase since the 2022 assessment. The count of juveniles in impact plots has declined since 2019 but remained similar to the 2020 and 2022 results. Mature individuals decreased since 2022 and are lower than the baseline counts. Conversely, saplings in control plots exhibited no notable differences between years. Juvenile and mature individuals in control plots increased since the baseline. Myrtle rust persisted in all surveyed plots. Impact plots consistently showed lower infection scores compared to control plots, with a significant decrease observed in myrtle rust levels in 2023 compared to the baseline. However, myrtle rust increased significantly in control plots since the baseline. Impact plots, with less established plant populations, particularly vulnerable to Myrtle Rust infection, may be more prone to population declines than control plots (RPS, 2024)

It's noteworthy that Impact Plot 2 exhibited fewer individuals compared to the baseline survey. This decline was attributed to the overgrowth of *Lantana camara* within the plot, potentially outcompeting or smothering smaller size classes. Implementing weed management strategies is advisable to alleviate additional pressure on the species.

In 2023, surveys aimed at assessing habitat for threatened amphibians in LW34 revealed an increase in frog species richness since the baseline (2019 and 2020), with a total of 10 species observed in impact plots and 15 in control plots. This indicates the ongoing persistence of amphibian species within the riparian habitats of LW34 (RPS, 2024)

The diversity of microbat species has seen a gradual increase since 2020, holding steady from 2022 to 2023. A potential roosting spot for the *Rhinolophus megaphyllus* (Horseshoe bat) was pinpointed in the EP Area, where it has maintained a consistent presence since 2020. Although three threatened microbat species—*Chalinolobus dwyeri*, *Miniopterus australis*, and *Saccolaimus flaviventris*—were observed in the EP region, their call frequencies did not suggest nearby roosting. Moreover, two new species, *Austronomus australis* and *Saccolaimus flaviventris*, were identified in both EP and control areas in 2023. Additionally, Song Meter units detected the presence of threatened Sooty Owls (*Tyto tenebricosa*) within the LW34 EP Area (RPS, 2024).

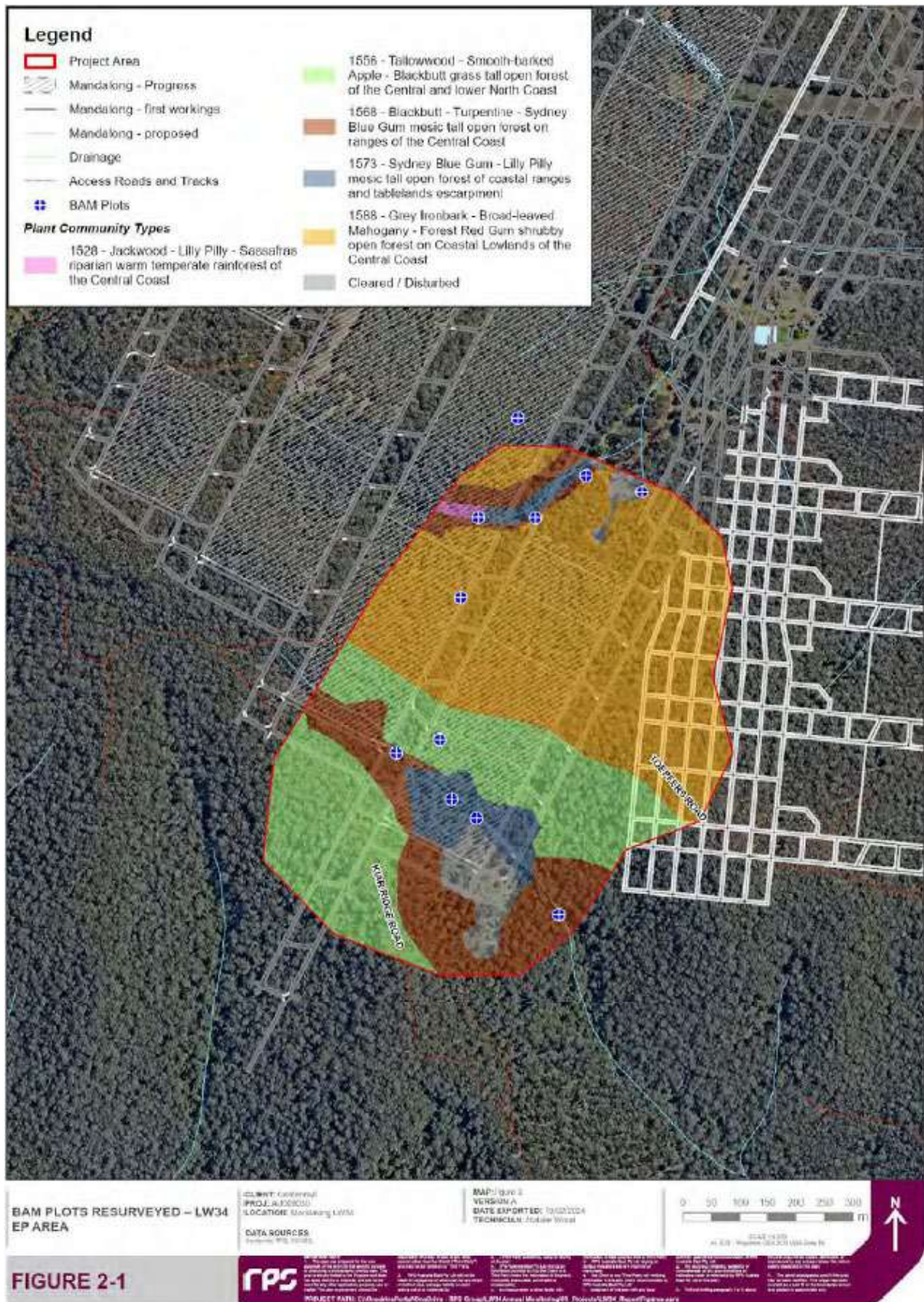
RPS (RPS, 2024) have reviewed the biodiversity data collected during 2023 and compared to baseline data (i.e., collected in 2020 and 2021), and data collected in 2022, to determine if a non-negligible impact to biodiversity outcomes has occurred since commencement of mining, as required by the consent conditions for Schedule 4, Condition 6(j) of SSD-5144.

No non-negligible changes were detected for the following measured biodiversity outcomes:

- Sensitive ecological communities;
- Threatened species;
- Threatened amphibians; and
- Threatened cave-associated microbats.

As per the above summary, a Trigger Action Response Plan (TARP) under the LW34 BMP was not triggered. Monitoring is to continue until biodiversity monitoring can be finished two years after completion of mining in the adjacent longwall panel in sensitive environments (which includes floodplains and GDEs) (RPS, 2024).





Source: (RPS, 2024)

Figure 6-16: Floristic Plots LW34 EP Site

### 6.5.5 LW57-60 & LW39-43 Extraction Plan Areas

During 2023 baseline ecological monitoring has continued for the LW57-60 and LW39-43 Extraction Plan areas. The monitoring of sensitive environments subject to potential subsidence impacts is a requirement as per Schedule 4, Condition 6 of SSD-5144. This monitoring is to be performed in accordance with the relevant approved Extraction Plan and associated BMP sub-plan. The BMP for LW57-60 defines the monitoring methods for threatened flora and Endangered Ecological Communities (EECs) that may be potentially influenced by subsidence-related impacts arising from the secondary extraction of Longwalls 57-60.

With mining expected to be undertaken within LW57-60 in 2024, ecological monitoring and potential subsidence impacts will be reported within the 2024 Annual Review.

### 6.5.6 Aquatic Ecology Monitoring

The objectives of the monitoring conducted by RPS in the Spring of 2023 were to build upon an understanding of the macroinvertebrate communities within the downstream receiving environment of LW25-29, LW30-31 and LW32 Extraction Plan areas, and to collect baseline data for LW34, LW39-43 and LW57-60. The associated monitoring report identifies spatial and temporal changes in macroinvertebrate community structure; identifies any potential key impacting processes resulting in changes to aquatic ecosystems health; and provides recommendations for the improvement of future monitoring rounds (RPS, 2024d).

RPS was responsible for conducting the spring sampling event at multiple sites (**Figure 6-16**) in accordance with the Biodiversity Management Plan (BMP).

Key results from the 2023 monitoring were:

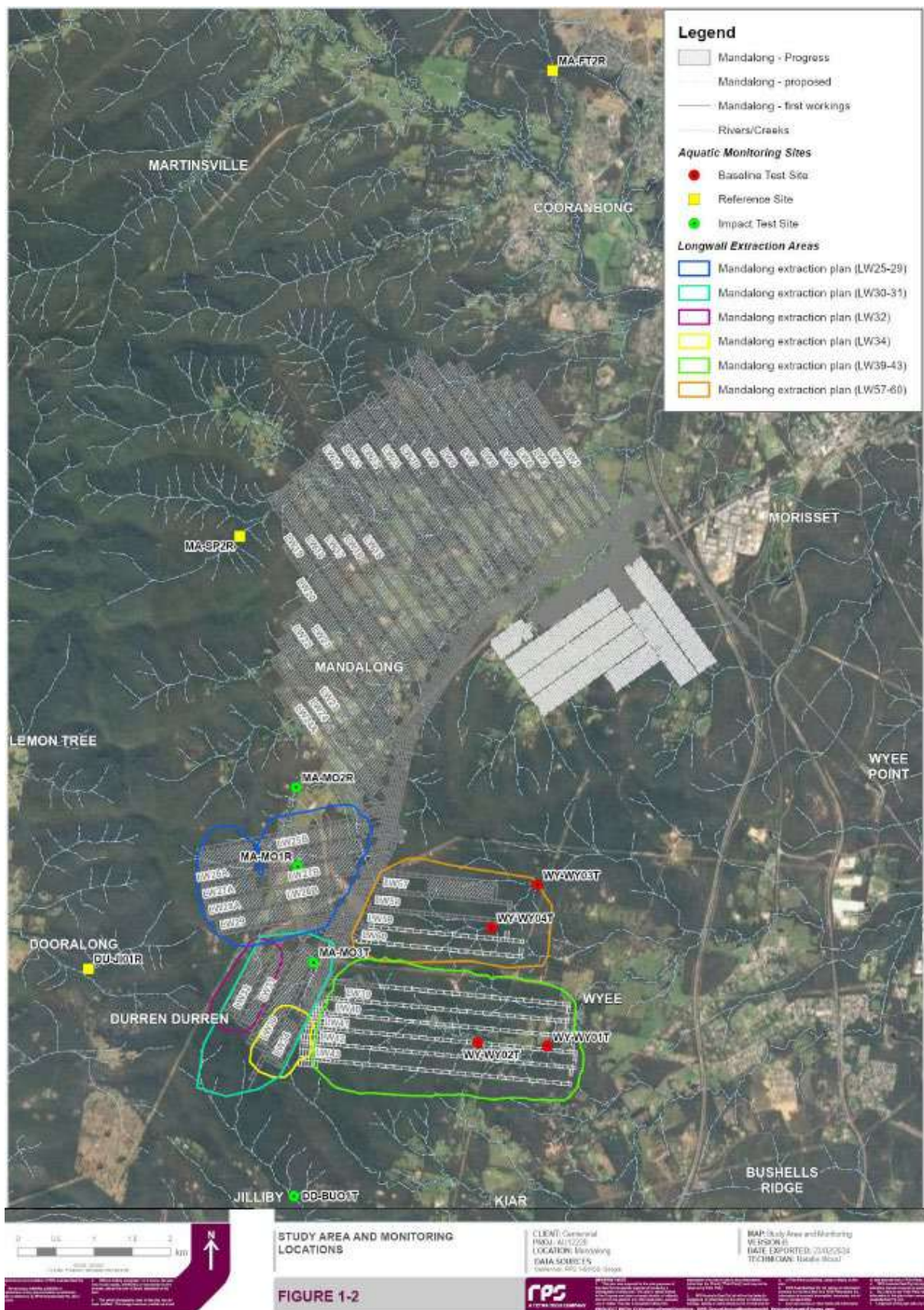
- Dissolved oxygen (DO) was below ANZECC (2000) guidelines across all treatment sites (baseline, impact test and reference sites) sampled but were generally comparable to baseline conditions;
- Turbidity at impact test site DD-BU01T, baseline site WY-WY03T and reference site MA-FT2R exceeded the upper limit of ANZECC (2000) guidelines;
- Ammonia concentrations exceeded ANZECC (2000) guidelines for all treatment sites, with the exception of reference site MA-FT2R;
- Nitrate concentrations exceeded ANZECC (2000) guidelines for impact test sites MA-M02R and DD-BU01T, and reference site MA-FT2R;
- Total nitrogen concentrations far exceeded ANZECC (2000) guidelines across all treatment sites sampled;
- Total phosphorus concentrations far exceeded ANZECC (2000) guidelines across all treatment sites sampled, with the exception of baseline site WY-WY03T;
- Filterable reactive phosphorus concentrations exceeded ANZECC (2000) guidelines for baseline site WY-WY02T;
- Taxonomic richness was generally comparable across all treatment sites and monitoring years, with the exception of MA-M01R and MA-M02R. Multivariate analysis showed statistically significant differences in taxonomic richness for impact test sites MA-M01R (in 2019 when compared to 2020, 2021, 2022 and 2023) and MA-M02R (in 2019 when compared to 2020 and 2022);
- PET taxa richness was generally comparable across all treatment sites and monitoring years;
- SIGNAL 2 index across all treatment sites were markedly lower in 2023 compared to 2022. Multivariate analysis showed statistically significant differences in SIGNAL 2 scores for test sites MA-M01R (in 2019 when compared to 2020) and MA-M02R (in 2018 when compared to 2023, and in 2019 when compared to 2022);
- Within the SIGNAL 2 Bi-plot, all test, baseline and reference sites (except Test site DD-BU01T) were grouped within Quadrant 1 and 2, indicating favourable habitat with high

salinity and nutrient levels which may be natural. Impact test site DD-BU01T was located in Quadrant 4, indicating anthropogenic activity and pollution impacts present.

- An overall improvement in water quality and habitat conditions, likely due to the La Niña weather event experience in 2022; and
- Macroinvertebrate composition in 2023 showed a large separation from 2022, but some similarity to previous monitoring years.

The monitoring conducted in 2023 revealed notable changes in various parameters compared to the 2022 event, including shifts in physical factors such as DO and turbidity, as well as changes in chemical water quality indicators and biological measures such as SIGNAL 2 scores and macroinvertebrate composition. These alterations coincided with a transition from the above-average rainfall associated with the La Niña weather event in 2022 to significantly drier conditions in 2023. However, despite these changes, the 2023 monitoring indicated no significant adverse impacts on the aquatic ecosystem health attributable to activities within EP Areas LW 25-29, LW 30-31, LW 32, and LW 34 (RPS, 2024d).





Source: (RPS, 2024d)

Figure 6-17: Aquatic Ecology Monitoring Locations

### 6.5.7 Land Management Strategy for the MSSS and TL24 Offset Areas

The construction of the MSSS and access road which was completed in 2017 resulted in the clearing of approximately 11.3 ha of MU 15: Coastal Foothills Spotted Gum – Ironbark Forest, which is not commensurate with any threatened ecological community listed under the *Threatened Species Conservation Act* (TSC Act 1995) or Environmental Protection and Biodiversity Conservation Act (EPBC Act 1999) (SLR, 2013a).

MU 15 is very common and widespread in the locality, occupying approximately 2,502 hectares within the Study Area and approximately 21,094 hectares between Ourimbah and Beresfield (NPWS 2003, cited in (SLR, 2013a). The proposed approved clearing area (which was 15.6 ha), therefore, amounts to approximately 0.6 percent of the total available vegetation community within the immediate area and approximately 0.07 percent of the total available vegetation community within the region. None of the land proposed to be cleared contains threatened flora species or endangered ecological communities.

For these reasons, Centennial Mandalong did not propose to provide a direct offset strategy. Rather, as a substantial landholder in the Mandalong Valley, Centennial Mandalong has developed a Land Management Strategy for land owned by Centennial in the Valley.

In addition, the relocation of TL24 has also resulted in 8.03 ha of vegetation clearing for the establishment of the new easement. Centennial Mandalong has also included in the Land Management Strategy an additional area of 73.6 ha in order to compensate for the loss of vegetation communities.

The Land Management Strategy provides for four lots identified in **Table 6-14**. The four lots form two sites referred to as Mandalong Road and Chapman Road. The two sites have been placed under a Conservation Property Vegetation Plan (PVP) under Native Vegetation Regulation 2013 (Clause 9(1)) in 2017.

**Table 6-15: Land Management Strategy Site Locations**

Approval Reference	LMS Site Reference	Lot	DP	Ownership	LGA	Area (ha)
SSD-5144	Mandalong Road Northern Lot	580	733227	Centennial Fassifern Pty Ltd	LMCC	18.37
	Mandalong Road Southern Lots	Lot A	110119	Centennial Fassifern Pty Ltd	LMCC	106.52
		902	541065	Centennial Fassifern Pty Ltd	LMCC	
SSD-5144 (MOD 1)	Chapman Road	152	755238	Centennial Fassifern Pty Ltd	LMCC	72.3

The objective of land management at Mandalong Road and Chapman Road are as follows –

- **Mandalong Road Objective** - coexistence of conservation and agricultural practices that retain or improve habitat.
- **Chapman Road Objective** - retain/maintain or improve ecological diversity of land to a self-sustaining system/environment.

RPS Australia East Pty Ltd (RPS) was engaged by Centennial Mandalong Pty Ltd to undertake the 2023 annual ecological monitoring of the land management sites as described in the Mandalong Land Management Strategy (LMS). These sites comprise land described as Lot

580 DP733227; Lot A DP110119; Lot 902 DP541065 and Lot 152 DP755238 as shown in [Figure 6-18](#) and [Figure 6-19](#) and their total areas indicated in [Table 6-14](#).

Baseline flora and fauna surveys were undertaken by RPS ecologists from 9-12, 16-20 and 23-27 March 2015. Repeat annual monitoring surveys of 22 BioMetric plots were undertaken by RPS ecologists in May and October 2023. Habitat assessment has been completed to determine condition of floristics within the Habitat Enhancement Map Units of the land management sites. Native and exotic plant species were recorded within a 20m x 20m (400 m<sup>2</sup>) plot nested within the 50m x 20m (1,000 m<sup>2</sup>). Cover abundance for each plant species was estimated and recorded. Species composition, condition and photographic data was also recorded.

BioMetric (Gibbons et al. 2009), as amended by the NSW BioBanking Assessment Methodology 2014 (BBAM 2014) (Office of Environment and Heritage, OEH 2014), was used as the monitoring method. Calculations were performed using the online NSW BioBanking Credit Calculator (BBCC) to compare monitoring data. The NSW Vegetation Information System (VIS) was interrogated to extract current benchmark data for BioMetric Vegetation Types (BVTs) used to classify each vegetation community examined in the monitoring program.

Within the Mandalong Farm Block Management area, native plant species richness (NPSR) has increased in the Habitat Enhancement Management Unit (MU) in both Plant Community Types (PCTs) 1619 and 1598. The NPSR scores of PCT 1716 within the Habitat Enhancement area have remained stable, while showing a notable increase within the Grazing MUs. This suggests that within these MUs habitat is being retained and enhanced. No significant changes have been noted in other MUs, therefore habitat is being retained. Within the Chapman Road Bush Block area generally no significant changes in NPSR or attribute scores, therefore habitat is being retained (RPS, 2024e).

Eight baseline monitoring plots were assessed in 2023 after being established in 2021 and 2022 for the following threatened flora species:

- *Melaleuca biconvexa* (BC Act: Vulnerable);
- *Rhodamnia rubescens* (BC Act: Critically Endangered; EPBC Act: Critically Endangered);
- *Genoplesium insigne* (BC Act: Critically Endangered; EPBC Act: Critically Endangered); and
- *Asperula asthenes* (BC Act: Vulnerable; EPBC Act: Vulnerable).

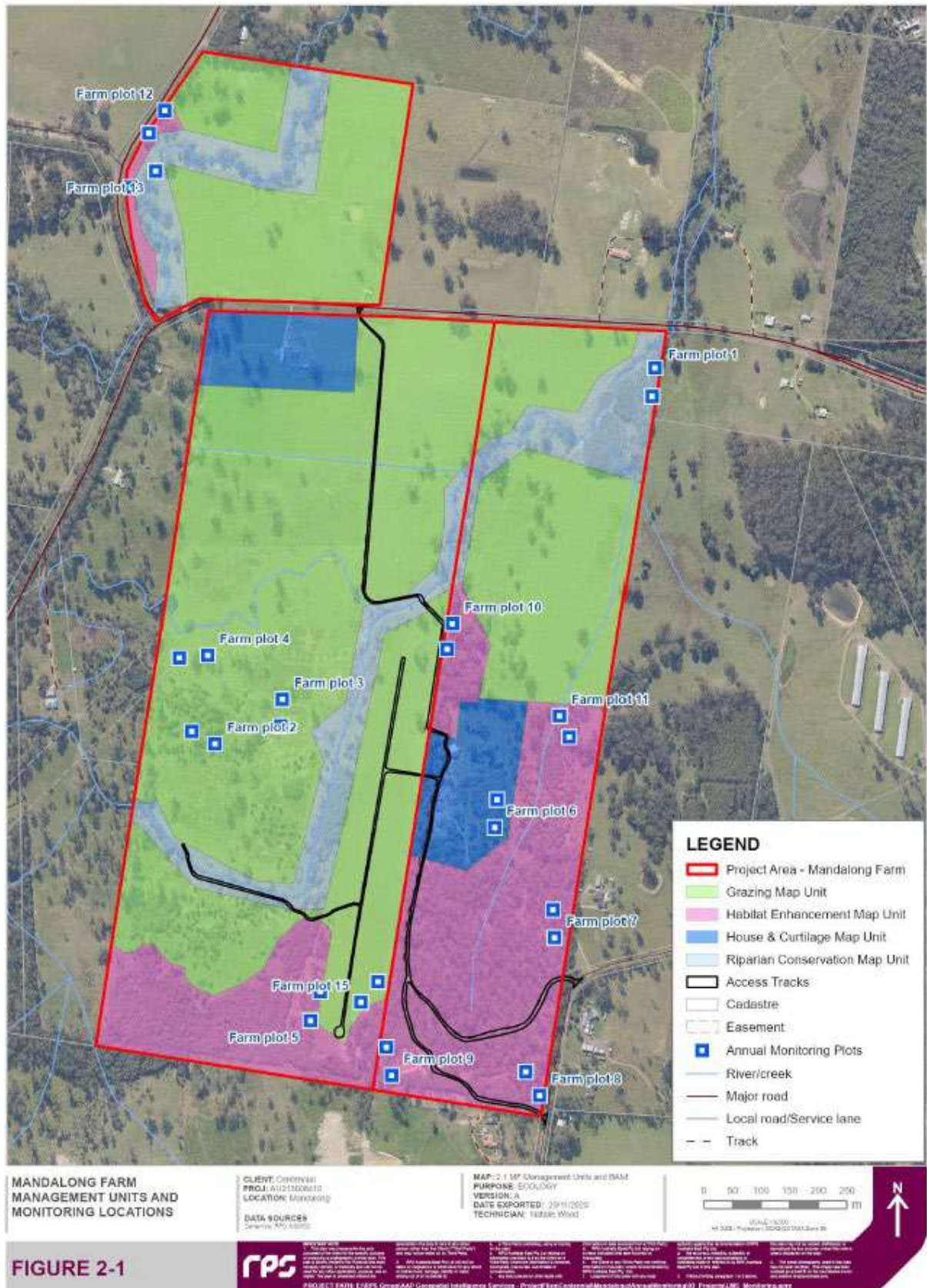
Key findings from threatened flora monitoring include:

- The *M. biconvexa* population has increased since 2022;
- The *R. rubescens* population has declined, with significant declines in height and DBH since 2022 with Offset Plots 5 and 11 being major contributors to this trend. It is likely that Myrtle Rust infection is the leading cause of population decline; and
- Fifteen *G. insigne* individuals were detected in the 2023 monitoring period after the survey was conducted during peak flowering period. This is the second highest count recorded thus far. (RPS, 2024e).

Overall, the condition measures within the Mandalong Farm Blocks suggest that the objective of the LMS for this site are being met, which is 'Coexistence of conservation and agricultural practices that retain or improve habitat'. Moreover, the condition measures within the Chapman Road Bush Block demonstrated that the objective of this site was met, which was



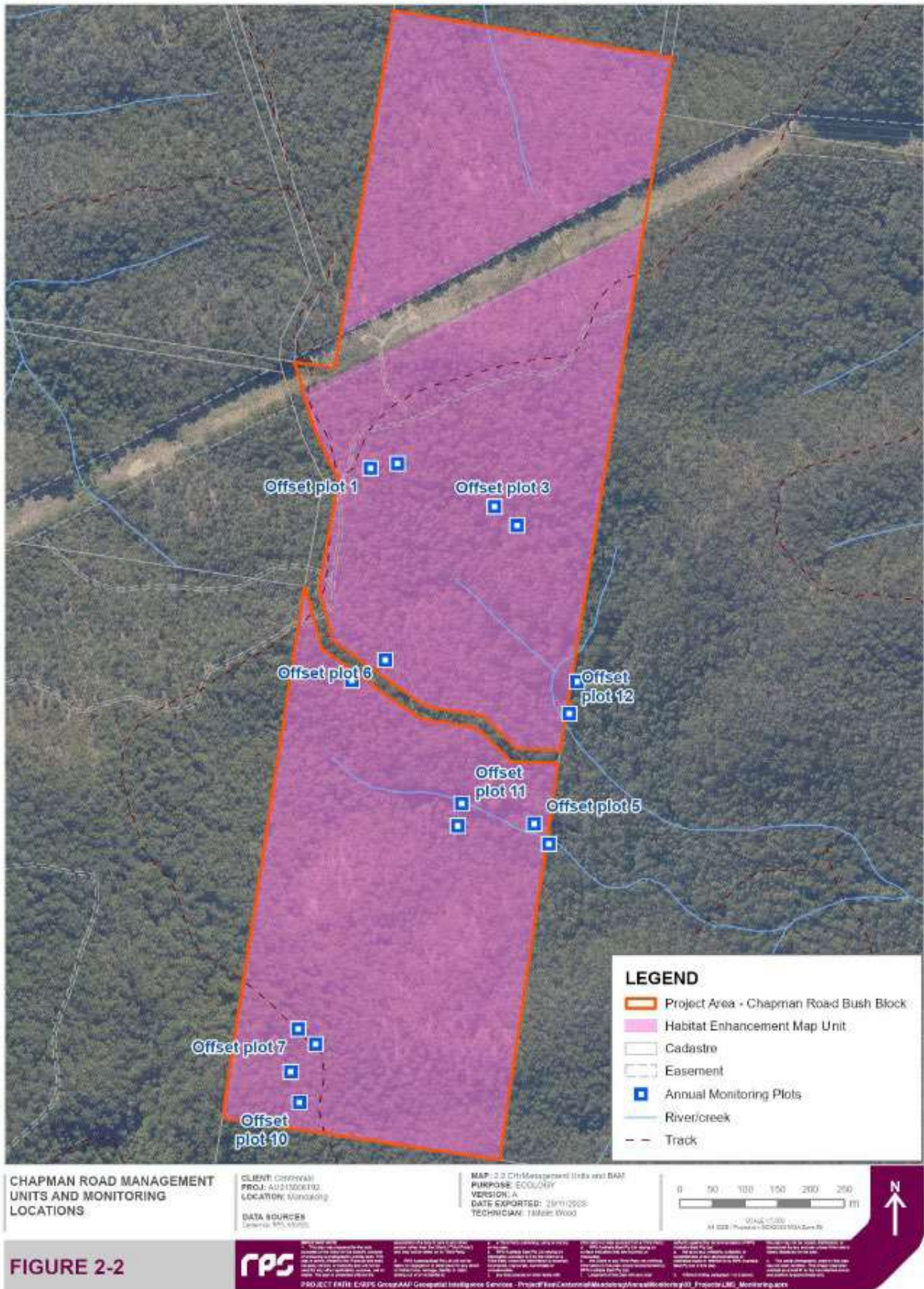
'Conservation management of land through practices that retain or improve habitat'. (RPS, 2024e).



Source: (RPS, 2024e)

Figure 6-18: Mandalong Farm Offset Area





Source: (RPS, 2024e)

Figure 6-19 : Chapman Road Bush Block Offset Area



### 6.5.8 MSSS & TL24 Nest Box Monitoring

In June and December 2023 RPS ecologists undertook the bi-annual monitoring of 328 nest boxes. The nest boxes were installed because of hollow-bearing tree loss associated with the Mandalong South Surface Site and associated Access Road, the TL24 Relocation Project and the 33kV powerline project.

This nest box monitoring program consists of the following sites:

- 128 nest boxes installed for the Transmission Line off-set (TL24-13 to TL24-139).
- 30 nest boxes previously installed for the Mandalong South Surface Site and Transmission Line offset (MSSS-01 to MSSS-18 and TL24-1 to TL24-12).
- 170 nest boxes installed in September 2021 as a mitigation measure following the loss of hollow-bearing trees associated with the 7.7 km, 33kV powerline from Mandalong Mine Access Site (MMAS) to the Mandalong South Surface Site (MSSS) (33. 1 - 170).

All nest boxes were inspected using a wireless nest box inspection camera to minimise disturbance to any fauna potentially occupying the nest boxes whilst also minimising personal safety risks involved with climbing ladders.

Results from the Winter 2023 monitoring event suggest nest box occupancy rates are still fluctuating. This monitoring event recorded the lowest winter occupancy rates since the inception of the nest box monitoring, primarily due to the decreased number of microbats recorded in this monitoring event. The number of arboreal mammals decreased since the previous winter monitoring event, however, these numbers are still consistent with the preceding monitoring events. The presence of nesting material suggests that arboreal mammals may be present at higher rates than implied by results. This indicates that nest boxes may be supporting the persistence of local arboreal mammals, which concurrently utilize other habitat in the peripheral landscape.

Results from the summer 2023 monitoring event demonstrate an increase in nest box occupancy in comparison to the previous two monitoring events. This suggests a return to levels similar to that of earlier monitoring events. While no gliders or frogs were observed during the summer 2023 monitoring event, a high number of brushtail possums and microbats were observed utilising the nest boxes.

The next box monitoring program which will continue in June and December 2024.

### 6.5.9 VAM-RAB Rehabilitation Off-Set Monitoring

Centennial Mandalong received approval in 2011 (DA97/800 Modification 7) for the trial installation of a ventilation air methane regenerative afterburner unit (VAM-RAB) that would remove and breakdown the exhaust methane.

Installation of the VAM-RAB unit necessitated clearing of some native vegetation. Two endangered ecological communities (EEC) listed in Schedule 3 of the NSW *Threatened Species Conservation Act* 1995 were included in the areas to be cleared. These were: Swamp Sclerophyll Forest (SSF) on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and River-Flat Eucalypt Forest (RFEF) on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.

DA97/800 Condition 76A included a requirement for a 1.25-hectare rehabilitation off-set area to be established on cleared land adjoining the VAM-RAB construction site. These EEC were represented by communities described in the regional vegetation mapping and classification (NPWS 2000) as: MU37 Swamp Mahogany Paperbark Forest (SSF); and MU38 Redgum – Rough-barked Apple Swamp Forest (RFEF).

An ecology survey (Hunter Eco, 2011) prepared for the VAM-RAB project application described the area to be rehabilitated as mostly dominated by weeds. This being the case,

active regeneration was required, and this was commenced in January 2012 and completed in March 2012.

Further to the requirement to rehabilitate, the consent also required that the progress of the rehabilitation be monitored annually for five years. Centennial Mandalong has opted to continue monitoring beyond the required five years. The current document is a report of the condition of the rehabilitation in December 2023, the eleventh year (Hunter Eco, 2023b).

The aim of the monitoring program conducted by Hunter Eco was to collect data that would enable a quantitative comparison between the relatively undisturbed communities and the areas being rehabilitated. This is achieved through the collection of floristic data from 400 m<sup>2</sup> permanently established plots. The normal plot size is 20 m x 20 m but the dimension can vary depending on the configuration of the available space. Two plots were established in each of the two undisturbed communities and two in each of the two areas being rehabilitated to these communities: eight plots in all.

All plots were permanently established with star pickets at each corner in 2012, and floristic data was collected on 15 December 2023. Hunter Eco (2023b) has concluded that a significant milestone has been reached in 2023 with cluster analysis now showing that there is no significant difference in overall native floristic composition between reference and rehab plots for both targeted threatened communities.



Source: (Hunter Eco, 2021)

**Figure 6-20: Location of Floristic Sample Plots**



### 6.5.10 Green & Golden Bell Frog Research Program

In 2016, Centennial Mandalong commenced the preparation and implementation of a research and monitoring program for the Green and Golden Bell Frog (GGBF) in accordance with EPBC approval (2013/6906) conditions of the Northern Coal Logistics Project.

As part of current operations at the Cooranbong Entry Site, underground mine water is pumped from the existing Mandalong Mine underground workings at an average rate of 0.6 to 4.0 ML/day and is discharged into an unnamed creek from Licensed Discharge Point 001 (LDP001) at the Cooranbong Entry Site. The unnamed creek flows into Muddy Lake which is also connected to Lake Macquarie via Lake Eraring.

Ecological surveys were first undertaken at Muddy Lake in October 2015. During these surveys, approximately five Green and Golden Bell Frog *Litoria aurea* (GGBF) individuals were identified. The Green and Golden Bell Frog is listed as an endangered species under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and as a vulnerable species under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The GGBFs identified at Muddy Lake are the only known records of the species within a 10 km radius of the Cooranbong Entry Site.

The research project will monitor GGBF populations and habitat quality within Muddy Lake in conjunction with reference populations to fulfil the relevant EPBC approval conditions. Monitoring commenced in late 2016, with approval received from the Department of Environment & Energy on 30 November 2016 for Professor Michael Mahoney to act as an independent peer reviewer for the purpose of reviewing the Green and Golden Bell Frog Research Program's methodology and final report.

Surveys were conducted by GHD within the study area over a two-week period in January - February 2017 and also in Spring 2017 and Summer 2017 / 18. Adult males, adult females and juvenile Green and Golden Bell Frogs were captured during the surveys. The size of the juveniles indicated that breeding has occurred either within the study area or within adjacent habitat in the past twelve months. At that stage, this suggested that the population was viable, although further surveys were required to examine trends in population structure. The presence of a viable population on the Central Coast, a large distance from the two known key populations, is likely to be important for the conservation of the species in the region.

Further surveys were conducted by GHD in December 2018 and in total, around 150 Green and Golden Bell Frog individuals were recorded during surveys across the lake. In the December 2018 surveys, 37 individuals were captured and released during the targeted surveys, an additional 85 individuals recorded as a result of canoe based surveys, and 25 individuals observed or heard during spotlighting surveys. Canoe-based surveys have shown to be a successful technique at Muddy Lake for assessing occupancy and population numbers (GHD, 2019b).

In the summer 2020-2021 program, Green and Golden Bell Frogs were recorded at all six sites surveyed at Muddy Lake, totalling 109 individuals, including many juveniles. This marked a substantial increase in numbers compared to December 2019, likely due to improved climatic conditions associated with the 2020-2021 La Nina event and recent breeding, as evidenced by the increased presence of juveniles (GHD, 2021c).

In February 2022, Green and Golden Bell Frogs were recorded at five of the six surveyed sites at Muddy Lake, with a total of 60 individuals, including 10 juveniles. This represents a decrease from the numbers recorded in March 2021, which can be attributed to inclement weather affecting survey detection and variations in microhabitats across different sites (GHD, 2022e).

In December 2023, Green and Golden Bell Frogs were recorded at six sites surveyed at the Muddy Lake, with a total of 53 individuals recorded, including 4 juveniles, a similar number to that recorded in the November 2022 survey (GHD, 2023).

Higher numbers of individuals were generally observed in habitat in the western portion of the lake where there are a variety of microhabitats, including emergent reeds, trees and pools or open shallow water. Fewer frogs were observed in the central section and eastern portion, similar to recent years. This may be due to the still dense *Salvinia molesta* (*Salvinia*) infestation in these areas. While the *Salvinia* impeded surveys, the lower numbers observed may also be due to the difficulty of surveying these areas (GHD, 2023).

Over the past year, discharges from CES into Muddy Lake have shown fluctuations. These discharges have had an influence on downstream water quality, affecting the macroinvertebrate community to some extent. The lake has generally exhibited moderate pH levels below the SSGV, coupled with high salinity levels surpassing the SSGV, and low dissolved oxygen levels. Concurrently, elevated levels of *Salvinia* in certain areas of the lake may have impacted frog distribution or detectability, particularly in the central and eastern regions. However, there has been a decrease in the extent of *Salvinia* infestation over the same period, potentially leading to improved conditions for the Green and Golden Bell Frog in these zones. The proliferation of *Salvinia* is likely linked to factors such as nutrient runoff from farms, previous high rainfall, and the dispersal of propagules by waterfowl, rather than solely attributable to mine discharges or their absence (GHD, 2023).

There is no evidence of a decline in the extent, or availability of Green and Golden Bell Frog habitat downstream of the discharge locations. Good quality habitat remains throughout the western portion of the lake, and high frog numbers were recorded during surveys in these areas (GHD, 2023).

## 6.6 CULTURAL HERITAGE

### 6.6.1 Aboriginal Archaeology – LW30-31, LW32, LW34 & LW57-60 Extraction Plan Areas

Heritage Management Plans have been prepared to support Extraction Plans for the extraction of coal from Mandalong Mine LW30-31, LW 32, LW 34 and LW 57-60.

The Study Area for the Heritage Management Plans encompassed the 26.5° angle of draw around these secondary extraction areas and Aboriginal heritage sites/items located within this total area are shown in **Table 6-15**. As these Aboriginal heritage sites/items are located within the mine workings area they may be impacted by subsidence.

In 2023, initial post-mining inspections (Phase 2) were undertaken for sites associated with LW34. Final post-mining inspections (Phase 3) were undertaken for sites associated with LW30-31 and LW32.

Baseline inspections (Phase 1) were also completed for sites associated with LW57-60 in 2023.

**Table 6-16: Aboriginal Cultural Heritage Sites (LW30-31, LW32, LW34 and LW57-60).**

AHIMS Number	Artefact No.	Aboriginal Cultural Heritage Site	Mining Location	Predicted Subsidence (m)	Actual Subsidence (m)	Comment
45-3-1228	Moran's Creek	Art (Pigment/ Engraved), Habitation Structure	LW30	0.09	0.07	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.
45-3-4552	MS9-GG-2	Grinding Groove	LW31	1.21	0.675	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.
45-3-4545	MS9-GG-3	Grinding Groove	LW30 / LW34	0.84	0.26	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.

AHIMS Number	Artefact No.	Aboriginal Cultural Heritage Site	Mining Location	Predicted Subsidence (m)	Actual Subsidence (m)	Comment
45-3-4546	MS9-RS-2	Habitation Structure	LW30 / LW34 AOD	0.19	0.10	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.
45-3-4544	MS9-RS-3	Habitation Structure	LW30 / LW34 AOD	0.09	0.04	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.
45-3-3492	RPS MAND STH CYL05	Grinding Groove	LW30 / LW34 AOD	0.29	0.24	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.
45-3-3586	RPS MAND STH PS01	Habitation Structure (with no deposit or objects)	LW31	1.23	0.87	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 2/12/22. Phase 3 final post-mining inspection was conducted on 4/12/23.
45-3-3639	RPS MAND STH PS02	Aboriginal Resource and Gathering (rock overhang)	LW31	0.79	0.54	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 2/12/22. Phase 3 final post-mining inspection was conducted on 4/12/23.



AHIMS Number	Artefact No.	Aboriginal Cultural Heritage Site	Mining Location	Predicted Subsidence (m)	Actual Subsidence (m)	Comment
45-3-3640	RPS MAND STH PS03	Aboriginal Resource and Gathering (rock overhang)	LW31	0.86	0.31	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 2/12/22. Phase 3 final post-mining inspection was conducted on 4/12/23.
45-3-3641	RPS MAND STH PS04	Aboriginal Resource and Gathering (rock overhang)	LW32	0.86	0.31	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 2/12/22. Phase 3 final post-mining inspection was conducted on 4/12/23.
45-3-3642	RPS MAND STH PS05	Aboriginal Resource and Gathering (rock overhang)	LW32	0.77	0.57	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 2/12/22. Phase 3 final post-mining inspection was conducted on 4/12/23.
45-3-3511	RPS MAND STH PS25	Artefact	LW31	0.93	0.53	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.
45-3-3512	RPS MAND STH PS26	Grinding Groove	LW30 / LW34	0.52	0.26	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.

AHIMS Number	Artefact No.	Aboriginal Cultural Heritage Site	Mining Location	Predicted Subsidence (m)	Actual Subsidence (m)	Comment
45-3-3594	RPS MAND STH PS27	Habitation Structure (with no deposit or objects)	LW30 / LW34 AOD	0.39	0.19	Baseline site inspection was conducted on 20 April 2021. Phase 2 initial post-mining inspection was conducted on 22/8/22. Phase 3 final post-mining inspection was conducted on 30/10/23.
45-3-3513	RPS MAND STH PS28	Potential Archaeological Deposit (PAD)	LW30 / 34 AOD	0.02	TBC	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Property has been sold – access has not been granted to complete Phase 3 monitoring.
45-3-3595	RPS MAND STH PS29	Habitation Structure (with no deposit or objects)	LW31 AOD	0.00	TBC	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 22/8/22. Property has been sold – access has not been granted to complete Phase 3 monitoring.
45-3-3596	RPS MAND STH PS30	Habitation Structure (with no deposit or objects)	LW34 AOD	0.62	0.1	Baseline site inspection was conducted on 20/4/21. Phase 2 initial post-mining inspection was conducted on 30/10/23.
45-3-3514	RPS MAND STH PS32	Potential Archaeological Deposit (PAD)	LW32	0.10	TBC	Baseline site inspection was conducted on 13/10/21. Phase 2 initial post-mining inspection was conducted on 2/12/22. Property has been sold – access has not been granted to complete Phase 3 monitoring.

AHIMS Number	Artefact No.	Aboriginal Cultural Heritage Site	Mining Location	Predicted Subsidence (m)	Actual Subsidence (m)	Comment
45-3-3643	RPS PS07	Habitation Structure (with no deposit or objects)	LW34 AOD	0.1	0.1	Baseline site inspection was conducted on 2/12/22. Phase 2 initial post-mining inspection was conducted on 30/10/23.
45-3-1225	Wye Creek	Grinding Grooves	LW57-58	0.33	TBC	Baseline site inspection was conducted on 8/11/22.
45-3-3467	RPS AH01	Grinding Grooves	LW58	0.2	TBC	Baseline site inspection was conducted on 8/11/22.

### 6.6.2 European Heritage

A Historic Heritage Management Plan was developed for Mandalong in 2016 to address European Heritage items located within the Mandalong lease boundary. The archival recording of the Landing Skid 2 which is located within the Mandalong South Surface Site disturbance boundary was completed by RPS in 2016 (RPS, 2017b). Landing Skid 2 was subsequently demolished in 2017 during the construction of the Mandalong South Surface Site. There were no further impacts to European Heritage items in 2023.

## 6.7 MINE SUBSIDENCE

Subsidence monitoring programs are developed, or active subsidence monitoring programs extended for each subsequent Extraction Plan submission. The intent of the Subsidence Monitoring Program(s) is to confirm subsidence performance is in accordance with the predictions and impacts as outlined in the approved Extraction Plan(s). Where measured subsidence is exceeded or impacts experienced during mining differ from that predicted in the approved Extraction Plan, Trigger Action Response Plans (TARPs) are activated to manage the potential non-compliance.

The Subsidence Monitoring Program includes provisions for all relevant built features including private dwellings, public roads, Telstra communications networks, Ausgrid powerlines, TransGrid 330kV transmission towers, and natural features such as wetlands, creeks, flood paths, steep slopes and key heritage features.

### 6.7.1 Subsidence Performance Measures and Reporting

All mining undertaken in 2023 was within mining leases ML1443 and ML1722 as per approved Development Consent SSD-5144. The approved subsidence performance measures are included in Schedule 4, Condition 1, Table 6, and Condition 4, Table 7 of Development Consent SSD-5144 and are included below as [Table 6-16](#) and [Table 6-17](#).

The current development consent also includes provisions for Incident Reporting, and Non-compliance Notifications under Schedule 6, Clauses 10 and 10A, as well as Regular Reporting on Centennial's website, and an Annual Review (as per this document) under Schedule 6, Clauses 11 and 12.

**Table 6-17: SSD-5144 Subsidence Performance Measures – Natural and Heritage Features**

<b>Watercourses</b>	
3 <sup>rd</sup> Order and above streams Groundwater-dependent Ecosystems	<ul style="list-style-type: none"> <li>No connective cracking between the surface, or the base of the alluvium, and the underground workings.</li> <li>No subsidence impact or environmental consequence greater than minor.</li> </ul>
1 <sup>st</sup> and 2 <sup>nd</sup> Order streams	<ul style="list-style-type: none"> <li>No subsidence impact or environmental consequences greater than predicted in the documents listed in condition 2(b) of Schedule 2.</li> <li>No connective cracking between the surface and the underground workings.</li> </ul>
Aquatic and riparian ecosystems, including affected sections of Morans Creek, Wyee Creek, Tobins Creek and Mannering Creek	<ul style="list-style-type: none"> <li>Maintain or improve baseline channel stability.</li> <li>Develop site-specific in-stream water quality objectives in accordance with ANZECC 2000 and Using the ANZECC Guidelines and Water Quality Objectives in NSW procedures (DECC 2006), or their latest versions.</li> </ul>
<b>Land</b>	
Steep slopes and rock outcrops	<ul style="list-style-type: none"> <li>No subsidence impact or environmental consequence greater than predicted in the documents listed in condition 2(b) of Schedule 2.</li> </ul>
Agriculture	<ul style="list-style-type: none"> <li>No loss of agricultural productivity greater than minor.</li> </ul>
<b>Biodiversity</b>	
Threatened species, threatened populations and endangered ecological communities	<ul style="list-style-type: none"> <li>Negligible environmental consequences.</li> </ul>
<b>Heritage sites</b>	

Stone Arrangement RPS TBM 32	<ul style="list-style-type: none"> <li>Negligible subsidence impacts or environmental consequences</li> </ul>
All other Aboriginal Cultural Heritage sites/items at the site	<ul style="list-style-type: none"> <li>No subsidence impact or environmental consequence greater than predicted in the documents listed in condition 2(b) of Schedule 2.</li> </ul>
<b>Mine workings</b>	
First workings under an approved Extraction Plan beneath any feature where performance measures in this table require negligible subsidence impacts or negligible environmental consequences	<ul style="list-style-type: none"> <li>To remain long-term stable and non-subsiding.</li> </ul>
Second workings	<ul style="list-style-type: none"> <li>To be carried out only within the approved mine plan, in accordance only with an approved Extraction Plan.</li> </ul>

**Table 6-18: SSD-5144 Subsidence Performance Measures – Built Features**

<b>Key Public Infrastructure</b>	
M1 Motorway	Always safe and serviceable.
Main Northern Railway	Damage that does not affect safety or serviceability must be fully repairable and must be fully repaired.
330 kV power supply infrastructure	
<b>Other Built Infrastructure</b>	
Power lines and power poles	Always safe.
Telecommunications infrastructure	Serviceability should be maintained wherever practicable.
Privately-owned residences	
Local Roads	
Other built features and improvements, (including access roads, farm dams, swimming pools, tracks and fences)	Loss of serviceability must be fully compensated.  Damage must be fully repairable and must be fully repaired or else replaced or fully compensated.
<b>Public Safety</b>	
Public Safety	Negligible additional risk.

### 6.7.2 Secondary Extraction Summary

During the 2023 calendar year, secondary extraction was undertaken via longwall mining including the entirety of LW34 and half of the inbye section of LW57. Secondary extraction of LW34 was covered by the LW34 Extraction Plan approved by DPIE in October 2022, and Secondary extraction of Longwall 57 was covered by the LW57-60 Extraction Plan approved by DPIE in July 2023 (refer [Table 6-18](#) for details).

**Table 6-19: Longwall Extraction during 2023**

Longwall	Commencement	Completion
LW34	07/01/2023	31/05/2023
LW57	28/08/2023	Ongoing

### 6.7.3 Subsidence Performance Results

Subsidence predictions were developed by Ditton Geotechnical Services in both 2022 and 2023, with the most recent assessment undertaken as part of the LW57-60 Extraction Plan which incorporates all mine plan variations up to Modification 10. The latest predictions

include a review of subsidence performance for the last 33 longwalls (i.e., LWs 1-32 and LW24A inclusive) (Ditton Geotechnical Services, 2023).

During 2023, vertical subsidence, tilt and strain were monitored on private properties, TransGrid towers on TL25/26, and the four following crosslines:

- Crossline 3
- Crossline 17
- Crossline 23 (TL25/26 transmission line, and LWs 28B,29 and 30)
- Crossline 24 (Toepfers Road, and LWs 30 to 32 & LW34).
- Crossline 25 (Binalong way and LWs 31-32); and
- Crossline 26 (Toepfers Road).
- Crossline 27 (Centennial and privately owned property).
- Centerline 57 (Centennial owned property)
- Area 2 (Centennial owned land off Mandalong road)

In conjunction with the above, visual inspections were undertaken on relevant steep slopes, Crown Roads, private access roads, and along easements incorporating the Telstra Communications Network, Transgrid Towers and Ausgrid Powerlines as per the Subsidence Monitoring Program.

The following tables taken from Ditton Geotechnical Serviced (2021) summarises the predicted v. measured subsidence, tilt and strain performance for LWs 13 through to LW31 taking in to account the reorientated LW30-31 mine layout (SSD-5144 MOD10).

**Table 6-20 - Summary of Predicted v. Measured First Maximum Subsidence**

LW Panel No.	Panel Width W (m)	Cover Depth H (m)	Panel W/H	Mining Height T (m)	SRP	First Panel Subsidence $S_{max}$ (m)		First Tailgate Chain Pillar Subsidence $S_p$ (m)	
						Predicted U95%CL	Measured	Predicted U95%CL	Measured
13	160	230	0.70	4.0	M	0.59	0.52	0.37	0.18
14	160	235	0.69	4.0	H	0.42	0.38	0.25	0.20
15	160	240	0.67	4.2	H	0.42	0.31	0.42	0.09
16	160	250	0.64	4.2	M	0.61	0.35	0.44	0.25
17	160	250	0.64	4.1	M	0.66	0.54	0.43	0.41
18	160	250	0.64	4.0	M	0.64	0.53	0.43	0.42
19	160	250	0.64	4.2	L	1.00	0.88	0.45	0.49
20	160	250	0.64	4.5	H	0.64	0.48	0.67	0.40
21	160	250	0.64	4.2	M	0.80	0.72	0.68	0.56
22	160	256	0.63	4.3	M	0.84	0.84	0.68	0.65
23	160	258	0.62	4.2	L	1.09	0.86	0.64	0.62
24	160	258	0.62	4.2	L	1.09	0.95	0.64	0.66
24a	160	260	0.62	4.2	L	1.08	0.93	0.64	0.68
25b	180	275	0.65	4.5	M	0.99	0.75	0.45	0.21
25b	180	290	0.62	4.3	M	0.88	0.63	0.61	0.32
26b	180	290	0.62	4.25	M	0.99	0.64	0.45	0.52
26b	180	320	0.56	4.3	M	0.88	0.92	0.61	0.52
27b	180	330	0.55	4.2	M	0.87	0.81	0.56	0.35
28a	180	320	0.56	4.0	M	0.83	0.74	0.55	-
28b	180	290	0.63	4.0	M	1.26	1.18	0.47	0.40
29	180	340	0.53	3.9	M	0.78	0.50	-	-
29	180	280	0.64	4.0	M	1.02	1.18	-	-

29	180	280	0.64	4.0	L	1.46	1.18	-	-
30	200	300	0.65	3.8	L	<i>1.26</i>	0.99	0.45	-
30	200	380	0.53	3.6	M	<i>0.84</i>	0.35	0.71	(0.50)
31	200	450	0.44	3.6	M	<i>0.71</i>	0.67	-	-

Underlined - measured value exceeds U95%CL prediction by < 15%. **Bold** - measured data exceed predictions by >15%. *italics* - measured subsidence indicated the SRP was one category lower than the borehole-based SRP. **Shaded** – predictions based on Mod 10 Report mine geometry; (value) - estimated from 2 x single panel value.

**Table 6-21 - Summary of Predicted v. Measured Tilt**

Panel No.	Panel Width W (m)	Cover Depth H (m)	Panel W/H	Mining Height T (m)	SRP	Predicted Maximum First & [Final] Tilt T <sub>max</sub> (mm/m)		Measured Maximum Tilt T <sub>max</sub> (mm/m)	
						Mean	U95%CL	Side 1	Side 2
13	160	230	0.70	4.0	M	6	9	5.6	7.2
14	160	235	0.69	4.0	H	3	5	3.9	5.0
15	160	240	0.67	4.2	H	3	5	2.0	5.0
16	160	250	0.64	4.2	M	5	8	2.0	8.5
17	160	250	0.64	4.1	M	6	9	6.1	6.3
18	160	250	0.64	4.0	M	6	9	5.5	6.1
19	160	250	0.64	4.2	L	12	19	6.3	7.4
20	160	250	0.64	4.5	H	4	6	4.5	5.5
21	160	250	0.64	4.2	M	7	10	5.7	<u>10.3</u>
22	160	256	0.63	4.3	M	8	11	7.2	<u>11.2</u>
23	160	258	0.62	4.2	L	13	20	9.0	11.7
24	160	258	0.62	4.2	L	13	19	6.4	12.1
24a	160	260	0.62	4.2	L	13	19	4.0	14.7
25b	180	275	0.65	4.3	M	9 [12]	13 [19]	10.3	13.3
25b	180	290	0.62	4.3	M	7 [13]	11 [19]	8.0	12.7
26b	180	290	0.62	4.25	M	9 [14]	14 [21]	8.9	11.6
26b	180	320	0.56	4.3	M	8 [16]	12 [24]	13.0	19.1
27b	180	330	0.55	4.2	M	7 [15]	11 [23]	9.5	10.8
28a	180	320	0.56	4.0	M	7 [15]	11 [22]	7.8	6.4
28b	180	290	0.63	4.0	M	10 [14]	15 [22]	13.7	18.4
29	180	340	0.53	3.9	M	7 [7]	10 [10]	4.0	2.8
29	<i>180</i>	<i>280</i>	<i>0.64</i>	<i>4.0</i>	<i>M</i>	<i>10 [10]</i>	<i>15 [15]</i>	<u>19.0</u>	<u>19.1</u>
29	180	280	0.64	4.0	L	18 [19]	27 [28]	19.0	19.1
30	200	300	0.65	3.8	L	12[17]	18[26]	10.8	-
30	200	380	0.53	3.6	M	6[14]	9[21]	12.2	-
31	200	450	0.44	3.6	M	4[13]	7[20]	4.9	-

U95%CL - Upper 95% Confidence Limit; Measured Side 1,2 - Measured peak value(s) above longwall panel on each side; *italics* - measured subsidence indicated the SRP was one category below the borehole-based SRP. **Bold** - Measured value exceeded maximum prediction by > 15%. underlined - < 15% prediction exceedance. **Shaded** – predictions based on Mod 10 Report geometry.



**Table 6-22 - Summary of Predicted v. Measured Tensile Strain**

Panel No.	Panel Width W (m)	Cover Depth H (m)	Panel W/H	Mining Height T (m)	SRP	Maximum Tensile Strain $E_{max}$ (mm/m)			
						Predicted		Measured	
						<i>mean</i>	<i>U95% CL</i>	<i>Panel Side1</i>	<i>Panel Side2</i>
13	160	228	0.70	4.0	M	2	3	2.7	-
14	160	236	0.68	4.0	H	2	3	2.2	2.9
15	160	245	0.65	4.2	H	2	3	1.4	0.2
16	160	247	0.65	4.2	M	3	5	0.5	0.6
17	160	250	0.64	4.1	M	3	5	0.5	1.7
18	160	240	0.67	4.0	M	3	5	0.8	0.4
19	160	249	0.64	4.2	L	3	5	1.1	1.4
20	160	254	0.63	4.5	H	4	5	2.3	1.0
21	160	255	0.63	4.2	M	4	5	1.4	2.1
22	160	255	0.63	4.3	M	4	6	2.3	2.3
23	160	257	0.62	4.2	L	4	6	3.1	3.1
24	160	258	0.62	4.2	L	4	5	3.1	3.5
24a	160	260	0.62	4.2	L	4	5	1.5	2.1
25b	180	275	0.65	4.3	M	5	7	4.1	1.0
25b	180	290	0.62	4.3	M	5	7	2.0	4.6
26b	180	290	0.62	4.3	M	4	6	3.3	2.5
26b	180	320	0.56	4.3	M	3	5	3.3	4.3
27b	180	330	0.55	4.2	M	4	6	3.4	-
28a	180	320	0.56	4.0	M	3	5	2.4	1.1
28b	180	290	0.63	4.0	M	4	6	1.5	2.8
29	180	340	0.53	3.9	M	3	4	1.7	1.3
29	180	280	0.64	4.0	M	4	6	2.7	5.1
29	180	280	0.64	4.0	L	6	9	2.7	5.1
30	200	300	0.65	3.8	L	5	8	3.3	-
30	200	380	0.53	3.6	M	2	4	1.7	2.7
31	200	450	0.44	3.6	M	2	3	<b>5.2</b>	-

**Bold** - Measured value exceeded U95%CL predictions by > 15%. underlined - < 15% prediction exceedance.

**Shaded** – predictions based on Mod10 Report geometry.

**Table 6-23 - Summary of Predicted v. Measured Compressive Strain**

Panel No.	Panel Width W (m)	Cover Depth H (m)	Panel W/H	Mining Height T (m)	SRP	Maximum Compressive Strain $E_{max}$ (mm/m)		
						Predicted		Measured
						<i>mean</i>	<i>U95% CL</i>	<i>Central Panel</i>
13	160	228	0.70	4.0	M	2	3	3.6
14	160	236	0.68	4.0	H	2	3	3.3
15	160	245	0.65	4.2	H	2	3	1.8
16	160	247	0.65	4.2	M	4	6	1.3
17	160	250	0.64	4.1	M	4	6	0.1
18	160	240	0.67	4.0	M	4	6	1.5
19	160	249	0.64	4.2	L	4	6	1.9
20	160	254	0.63	4.5	H	4	7	3.5
21	160	255	0.63	4.2	M	4	7	4.1
22	160	255	0.63	4.3	M	5	7	4.8
23	160	257	0.62	4.2	L	5	7	<u>7.5</u>
24	160	258	0.62	4.2	L	5	7	2.6
24a	160	260	0.62	4.2	L	5	7	3.5
25b	180	275	0.65	4.3	M	6	9	4.3
25b	180	290	0.62	4.3	M	6	9	4.5
26b	180	290	0.62	4.3	M	5	7	2.6
26b	180	320	0.56	4.3	M	4	6	5.0
27b	180	330	0.55	4.2	M	4	6	4.9
28a	180	320	0.56	4.0	M	4	6	1.4
28b	180	290	0.63	4.0	M	5	7	5.6
29	180	340	0.53	3.9	M	4	6	2.6
29	180	290	0.64	4.0	M	5	7	5.3
29	180	290	0.64	4.0	L	7	11	5.3
30	200	300	0.65	3.8	L	6	10	9.8
30	200	380	0.53	3.6	M	3	5	<b>5.9</b>
31	200	450	0.44	3.6	M	3	4	2.3

**Bold** - Measured value exceeded U95%CL predictions by > 15%. underlined - < 15% prediction exceedance.

**Shaded** – predictions based on Mod 10 Report geometry.

**Table 6-24: Assessment of Subsidence Performance against Performance Measures and Predicted Impacts**

Feature	Subsidence Performance Measures	Predicted Subsidence Impact EP LW34 and EP LW57-60	Assessment of Performance against Predicted Impact
<b>Private Property</b>			
Dwellings	<p><i>Always safe.</i></p> <p><i>Serviceability should be maintained wherever practicable.</i></p> <p><i>Loss of serviceability must be fully compensated.</i></p> <p><i>Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.</i></p>	Subsidence predictions below SSR criteria, with all dwellings remaining SSR.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>
Flood – dwelling and access	<p><i>Dwelling floor level to remain 0.5m above post mining 100 year ARI flood level - acquisition and compensation procedure if subsided floor level is below flood level.</i></p>	All dwellings freeboard remains above 100 year flood level at the maximum predicted subsidence and two times maximum predicted subsidence.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>
Agriculture	<p><i>No loss of agricultural productivity greater than minor.</i></p>	No loss of landuse to State Forest or agricultural productivity to private property (hobby farms) and Centennial properties.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>
<b>Infrastructure</b>			
Local Roads and Access	<p><i>Always safe.</i></p> <p><i>Serviceability should be maintained wherever practicable.</i></p> <p><i>Loss of serviceability must be fully compensated.</i></p> <p><i>Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.</i></p> <p>Public Roads Management Plan LW34 Public Roads Management Plan LW57-60</p>	<p>Low level of damage predicted Toepfers Road, Kiar Ridge Road and Binalong Way To remain safe, serviceable and repairable.</p> <p>No change to flood hazard.</p>	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>


Feature	Subsidence Performance Measures	Predicted Subsidence Impact EP LW34 and EP LW57-60	Assessment of Performance against Predicted Impact
Electricity Transmission Lines (330kV)	<p><i>Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.</i></p> <p>Transmission Line Management Plan LW32 for TL25/26 Towers 43 to 45</p> <p>Transmission Line Management Plan LW57-60 for TL25/26 Towers 36 to 37</p>	<p>No impact to serviceability of transmission lines.</p> <p>Concrete cruciform footings constructed on TL25/26 towers 39 to 42.</p> <p>Towers 36 &amp; 37 outside angle of draw, impact to be minor far field strains and possible leg spread.</p>	<p><b><i>Impact as predicted. No performance measure exceedances observed.</i></b></p>
Powerlines (11kV)	<p><i>Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired</i></p> <p>Powerline Management Plan LW34 Powerline Management Plan LW57-60</p>	<p>No impact to serviceability of powerlines.</p> <p>Mitigation measures were installed by Ausgrid on powerlines prior to development of subsidence.</p>	<p><b><i>Impact as predicted. No performance measure exceedances observed.</i></b></p>
Communications	<p><i>Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired</i></p> <p>Communications Management Plan LW34 Communications Management Plan LW 57-60</p>	<p>Low impact. No disruption to copper cable buried or aerial networks.</p>	<p><b><i>Impact as predicted. No performance measure exceedances observed.</i></b></p>
<b>Natural Features</b>			
Biodiversity	<p><i>Negligible environmental consequences to threatened species, threatened populations and endangered ecological</i></p>	<p>Negligible environmental consequences.</p>	<p><b><i>Impact as predicted. No performance measure exceedances observed.</i></b></p>

Feature	Subsidence Performance Measures	Predicted Subsidence Impact EP LW34 and EP LW57-60	Assessment of Performance against Predicted Impact
	<i>communities</i>		
Floodplain	Floodplain inspection and monitoring	Minimal changes to creek channel flows or alignment.  Predicted no surface cracking on floodplain.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>
Remnant Ponding	Flood Modelling	Minor increase to existing ponding predicted over LW25 to LW31. Increase in existing ponding over LW32.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>
Groundwater	Groundwater Monitoring and Management Plan	Predicted no adverse subsidence related impacts on alluvium groundwater levels and water quality.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>
Steep Slopes and rock outcrops	<i>No subsidence impact or environmental consequence greater than predicted in the documents listed in SSD-5144 Condition 2(b) of Schedule 2.</i>  Public Safety Management Plan LW34  Public Safety Management Plan LW57-60	Two dwellings potentially vulnerable to rock rollout deemed to be 'very unlikely'.  Two unsealed access tracks located in the EP Area as displayed in where identified and listed as 'potentially vulnerable' to rock rollout above LW59-60.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>
<b>Heritage</b>			
Heritage and Archaeology	<i>No subsidence impact or environmental consequence greater than predicted in the documents listed in SSD-5144 Condition 2(b) of Schedule 2.</i>	No impact to the Aboriginal cultural heritage sites identified within EP LW25-29, LW30-31 and LW32 above predictions.  Widening of an existing joint in a rock bar adjacent to TBM34 (AHIMS # 45-3-3542) grinding grooves was identified by Centennial on 13 April 2021.  The cracking damage potential to site RPS TBM 34 was predicted as "possible" by Ditton Geotechnical Services.	<b><i>Impact as predicted. No performance measure exceedances observed.</i></b>

## 6.8 REMNANT PONDING MONITORING & REMEDIATION

During 2023 flood remediation works were also progressed for one property and is ongoing. Post mining flood modelling (LW1-25) completed in 2021 along with observations confirmed that one creek crossing has been impacted by an increase in flooding hazard. Rehabilitation works are in progress to restore the serviceability of the creek crossing. **Table 6-24** highlights the remediation works conducted during 2023.

**Table 6-25: Details of Ponding & Remedial Action**

Remnant Ponding and Flooding Remediation							
Location	Description	Remediation	Remediation Comments	Ponding Predicted	Subsidence Completed	Status	Property Ref. Lot & DP
Longwall 24	Morans Creek Crossing		<p>Increase in flooding at a 1-year event. Investigation works and design for remediation to bridge and approaches.</p> 	No	No	<p>In progress.</p> <p>Flood modelling and Geotech completed.</p> <p>Design for replacement culvert or bridge in progress. Currently preparing DA for submission.</p>	Ref. 2203/168774
Longwall 31	Dam	Compensation	N/A	No	Yes	Negotiation	Ref.MS01073/805044

## 6.9 FLOODPATH MONITORING

The LW25-29, LW30-31, LW32, LW34 and LW57-60 Extraction Plan – Water Management Plans require the condition of major flood paths be inspected every six months or following a flood event. Floodpath monitoring was conducted in June and December 2023 with survey and photographic records of subsidence induced changes to Morans Creek, Byrons Gully and Wyee Creek recorded. There was no evidence of subsidence induced changes or impacts to Morans Creek, Byrons Gully and Wyee Creek recorded in 2023.

On the basis of the information obtained from field surveys, the pre mining characteristics of Morans Creek and Wyee Creek can be described as having a generally poorly defined channel system, in which creek lines give way to undefined overland flow paths in several areas. The levels of predicted subsidence and associated grade changes along Morans Creek and Byrons Gully over Longwalls 25-29 are of a similar order of magnitude to the existing creek bed slopes. The levels of predicted subsidence along the unnamed tributary of Wyee Creek are relatively small over Longwalls 57-58 and it is therefore considered that these will not significantly alter the flow conveyance capacity of the existing channels. The associated impacts on the maximum flood depths and flood hazards that have been modelled are not considered to be significant.

Centennial Mandalong will continue undertaking six monthly floodpath monitoring for Morans and Wyee Creek in 2024.

## 6.10 WASTE MANAGEMENT

All opportunities for waste avoidance and minimisation are considered by all staff and contractors across all areas including contracts, purchasing, equipment procurement and waste generation processes.

Waste oil and greases are stored in tanks and drums within bunded areas for removal by a licenced waste management contractor for recycling or disposal. Oil water separation is achieved using hydro-cyclone oil water separators at Mandalong and at the Cooranbong Entry Site on flows from vehicle work and storage areas and the wash down bays.

Hydrocarbon spill kits are inspected weekly by a licenced waste management contractor and re-stocked as required. Oily rag bins and oil filter bins are also serviced on a weekly basis.

Office paper and cardboard is collected and recycled by a licenced waste management contractor on a weekly basis. Metals are collected and stored in steel bins at Mandalong and the Cooranbong Entry Site. In 2023, a total of 348.6 tonnes of scrap steel was recycled. This is a decrease compared to 2022 during which a total of 574.234 tonnes of scrap steel was recycled.

General refuse and non-recyclable materials are sorted and stored in 30m<sup>3</sup> steel bins at Mandalong and the Cooranbong Entry Site. The material was collected by a licenced waste management contractor for disposal. In 2023, 664.220 tonnes of refuse material was taken off-site which is a decrease compared with 786.130 tonnes of refuse material in 2022.

Of the total waste collected at Mandalong in 2023, 65.42% was recycled including steel, timber, liquid waste, oils, paper and cardboard, filters grease, oily rags and oil filters. This compares with a recycling result of 84.32% in 2022.



## 7 WATER MANAGEMENT

### 7.1 WATER EXTRACTION

Mandalong Mine holds a water access licence (WAL39767) permitting the extraction of groundwater from the coal measures encountered during the process of mining. This water access licence permits the Mine to dewater the underground coal measures via a submersible dewatering pump located at Cooranbong. The WAL entitles the Mine to extract 1825 ML of groundwater annually for the period 1 July to 30 June from North Coast Fractured and Porous Rock Groundwater Sources. This mine water is subsequently discharged at LDP001.

Mandalong Mine extracted a total volume of 941ML of ground water during the annual period 1 July 2022 to 30 June 2023. There are no other conditions on the Water Access Licence.

The passive take inflow (groundwater make) for the 2023 report period was calculated to be 259ML (GHD, 2024b).

Table 7-1: Water Take

License #	Water Sharing Plan, source and management zone (as applicable)	Entitlement	Passive take / inflows	Active pumping	TOTAL (1 July to 30 June).
<b>WAL39767</b>	North Coast Fractured and Porous Rock Groundwater Sources	1825 ML	259 ML	941 ML	682 ML

### 7.2 SURFACE WATER MONITORING

#### 7.2.1 Mandalong & Cooranbong Entry Site

There is an established surface water quality monitoring program for the Mandalong catchment conducted since periodic sampling commenced in 1996, with the program established on a regular frequency since August 1999. Three surface water monitoring points (SW13-15) above licenced discharge points LDP001 and LDP002 at the Cooranbong Entry Site and two monitoring points (SW16-17) in the receiving waters below the licence discharge points (LDP's) were added in late 2011. The monitoring locations are shown on **Plan CM00315b, Plan CM00315C, Plan CM00315d, and Plan CM00315f** and are summarised below in **Table 7-3**.

Mandalong Mine currently holds EPL 365, with water licensed to be discharged from the CES, MMAS and MSSS through the following LDPs:

- g) LDP001 – Located at the CES and discharges into an unnamed tributary of Muddy Lake.
- h) LDP002 – Located at the CES 5 ML Dam and discharges into an unnamed tributary of Muddy Lake.
- i) LDP003 – Located at the MMAS Sediment Dam.
- j) LDP004 – Located at the MSSS Sediment Dam.

Water volume discharged off site is measured through LDPs. EPL365 limits the maximum volume of water to be discharged at LDP001 to 5000 Kilolitres per day (note: Condition L3.2 of EPL365 permits the volume limit to be exceeded if a rainfall event greater than 10 mm occurred in the prior 24 hours).

The pH, Total Suspended Solids (TSS mg/L), Electrical Conductivity (EC  $\mu\text{s}/\text{cm}$ ), and Oil and Grease (mg/L) are monitored daily at Licenced Discharge Points LDP001, LDP003, and

LDP004 during discharge, while LDP002 is monitored weekly during discharge, in accordance with the requirements outlined in EPL 365 and the Water Management Plan. In August 2023, a variation was made to EPL 365 to transition LDP001 from daily monitoring to monthly. However, Centennial Mandalong is currently awaiting approval of the water management plan from DPHI before the monitoring frequency can be adjusted.

An EPL365 water quality limit criterion for LDP001, LDP002, LDP003 and LDP004 is provided in **Table 7-2**.

**Table 7-2 LDP Limit Criteria**

Pollutant	Units of measure	100 percentile limit
Oil & Grease	mg/L	10
pH	pH	6.5-8.5
Total Suspended Solids	mg/L	50

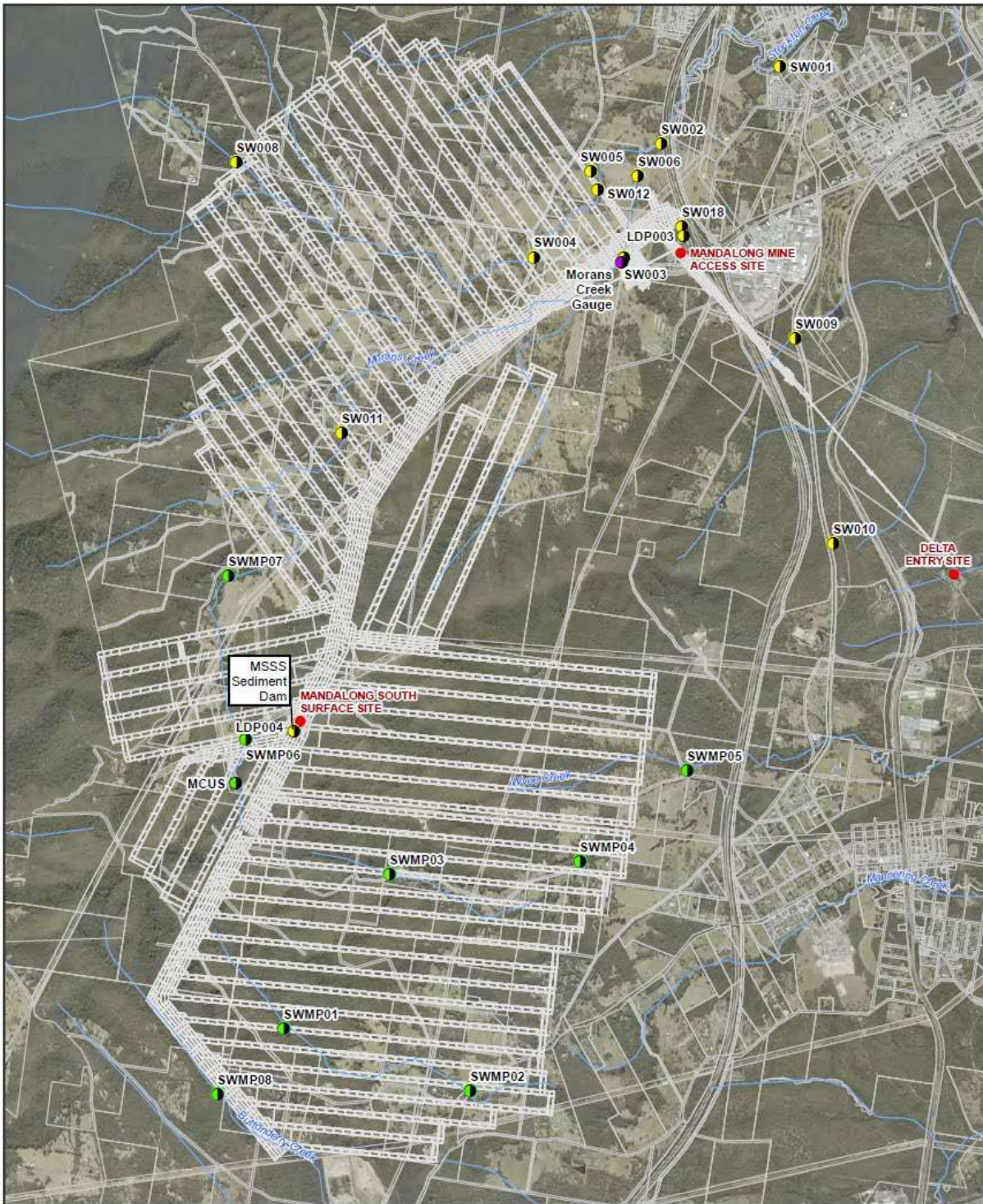
**7.2.2 Cooranbong Haul Road**

The Cooranbong Haul Road crosses three ephemeral creeks in the Lords Creek sub-catchment. Six sediment basins have been constructed along the haul road to contain dirty water runoff. Monitoring of the water quality in the haul road sediment control dams was undertaken in 2023 to assess the effectiveness of water treatment prior to controlled releases.

**7.2.3 Surface Water Monitoring Results**

Surface water quality is monitored at 22 locations on a monthly or quarterly basis. These locations encompass four different catchment areas. The water is tested for pH, Total Suspended Solids (TSS) and Electrical Conductivity (EC). The annual average and long-term average (LTA) results are summarised in **Table 7-4**.





<p>1:55,000 for A4</p> <p>0 0.25 0.5 1 1.5 2</p> <p>Kilometers</p> <p>Map Projection: Universal Transverse Mercator Horizontal Datum: Geodetic Datum of Australia 1994 Grid: Map Grid of Australia, Zone 56</p>		<p><b>LEGEND</b></p> <ul style="list-style-type: none"> <li> Cadastral</li> <li> Mandalong South Surface water monitoring locations</li> <li> Mandalong Surface water monitoring locations</li> <li> Morans Creek Gauge</li> <li> Watercourse</li> </ul>																
<p><small>© 2021. Whilst every care has been taken to prepare this map, GHD and Centennial Australia make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.</small></p>	<table border="1"> <tr><td>LOCATION</td><td>Mandalong</td></tr> <tr><td>SEAM</td><td>West Wallarah</td></tr> <tr><td>DRAWN</td><td>DS</td></tr> <tr><td>CHECKED</td><td>TT</td></tr> <tr><td>APPROVED</td><td>SG</td></tr> <tr><td>SCALE</td><td>refer to scalebar</td></tr> </table>	LOCATION	Mandalong	SEAM	West Wallarah	DRAWN	DS	CHECKED	TT	APPROVED	SG	SCALE	refer to scalebar	<p>Mandalong Mine Water Management Plan</p> <p>Surface Water Monitoring Locations</p>	<table border="1"> <tr> <td>DATE</td> <td>24/10/2021</td> <td>Figure 4-1</td> </tr> </table>	DATE	24/10/2021	Figure 4-1
LOCATION	Mandalong																	
SEAM	West Wallarah																	
DRAWN	DS																	
CHECKED	TT																	
APPROVED	SG																	
SCALE	refer to scalebar																	
DATE	24/10/2021	Figure 4-1																

Figure 7-1 Surface Water Monitoring Locations

**Table 7-3: Summary of Monitoring Locations with Respect to Position within the Catchments**

Location Reference	Creek Sub-catchment
SW008	Upper Stockton Creek
SW004	Mid Stockton Creek
SW012	Lower Stockton Creek
SW011	Upper Morans Creek
SW003	Mid Morans Creek
SW006	Lower Morans Creek
SW002	At confluence of Morans Creek and Stockton Creek
SW001	Downstream confluence on Stockton Creek
SW009	South Pourmalong Creek
SW010	North Pourmalong Creek
SWMP01	Mannering Creek within Olney State Forest
SWMP02	Mannering Creek at Hue Hue Road
SWMP03	Wye Creek at Wye Farms Road
SWMP04	Wye Creek at Wye Farms Road Bridge
SWMP05	Wye Creek at junction of Schofield Road and Manhire Road
SWMP06	Morans Creek at Mandalong Road
SWMP07	Upper catchment of Morans Creek
SW13	Muddy Lake (Unnamed tributary upstream LDP001).
SW14	Muddy Lake (Unnamed tributary upstream LDP002).
SW15	Muddy Lake (Unnamed tributary upstream LDP002).
SW16	Muddy Lake (Unnamed water body 1km downstream Simpson Rd Causeway Crossing)
SW17	Muddy Lake (North Dora Creek Village)

**Table 7-4: Average Surface Water Quality for the 12 month Period from January 2023 to December 2023 ('Annual') and the Long-term Average ('LTA').**

Site Location	Catchment	pH		TSS		Specific Conductance uS/cm	
		Average	LTA	Average	LTA	Average	LTA
SW008	Stockton	7.0	6.2	3.5	28.2	863	861.6
SW004		7.00	6.7	9.8	17.8	611.8	701.8
SW012		6.40	6.2	58	30.7	1204.30	1045.1
SW011	Moran's	N/A	6.60	N/A	48.1	N/A	543.7
SW006		6.8	6.5	7.0	19.5	548.3	501.1
SW003		7.0	6.40	5	19.2	488.5	463.2
SWMP06		6.62	6.45	N/A	42.86	659	704.28
SWMP07		7.08	6.71	8.25	15.75	548.25	558.73
SW002	Stockton & Moran's Creek (Confluence)	6.6	6.9	14.0	14.3	21121.8	13286.5
SW001		7.4	7.1	6.5	12.4	44675	30049.8
SW009	Pourmalong	6.8	6.5	12.0	16.8	286	304.9
SW010		7.0	6.2	22.0	26.1	772.3	501
SWMP01	Mannering Creek	6.14	6.65	9.50	6.00	682	501.80
SWMP02		6.94	6.58	37	16.92	370.67	468.22
SWMP03	Wye Creek	6.74	6.64	17.5	13.92	374	400.96
SWMP04		6.93	6.72	25.5	14.54	509	636.39
SWMP05		6.91	6.56	10	26.29	894	502.70
SW013	Muddy Lake	8.0	7.1	2.4	7.0	3520	3308.1
SW014		6.50	6.74	33.40	18.31	2834	916.18
SW015		5.64	5.63	86.86	115.15	76.57	80.67
SW016		8.31	8.26	24.50	468.19	3590	3115.30
SW017		7.77	8.06	40.70	30.64	3197	2841.57

#### 7.2.4 Surface Water Discharge Monitoring

The maximum daily volume discharged from LDP001 was 4817kL. There was no exceedance of the discharge volume limit of 5000kL per day. The total volume of water discharged from



LDP001 for the 2023 reporting period was 1071ML. The average daily discharge volume was 2950kL.

**Table 7-5: LDP001 Discharge Volume**

Frequency	No. of measurements made	Lowest result (kL)	Mean result (kL)	High result (kL)
Daily during any discharge	261	0	2950	4817

There were no exceedances of the water quality limits at LDP001 for the reporting period. During the reporting period two hundred and sixty-nine LDP001 samples were analysed. The maximum recording for oil and grease was 3mg/L, total suspended solids was 17mg/L and pH ranged from 7.60 to 8.13. The average annual results at LDP001 are summarised in **Table 7-6**.

**Table 7-6: Water Quality LDP001**

Pollutant	Unit of Measure	No of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Oil & Grease	milligrams per litre	261	269	0	0.16	3.00
pH	pH	261	269	7.60	7.78	8.13
Total suspended solids	milligrams per litre	261	269	0	2.84	17.00

There were no exceedances of the water quality limits at LDP002 for the reporting period. Zero samples from LDP002 were analysed as there was no discharge during the reporting period. The average annual results at LDP002 are summarised in **Table 7-7**.

**Table 7-7: Water Quality LDP002**

Pollutant	Unit of Measure	No of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Oil & Grease	milligrams per litre	0	0	-	-	-
pH	pH	0	0	-	-	-
Total suspended solids	milligrams per litre	0	0	-	-	-

There were no exceedances of the water quality limits at LDP003 for the reporting period. Zero samples from LDP003 were analysed as there was no discharge during the reporting period. The average annual results at LDP003 are summarised in **Table 7-8**.



**Table 7-8: Water Quality LDP003**

Pollutant	Unit of Measure	No of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Oil & Grease	milligrams per litre	0	0	-	-	-
pH	pH	0	0	-	-	-
Total suspended solids	milligrams per litre	0	0	-	-	-

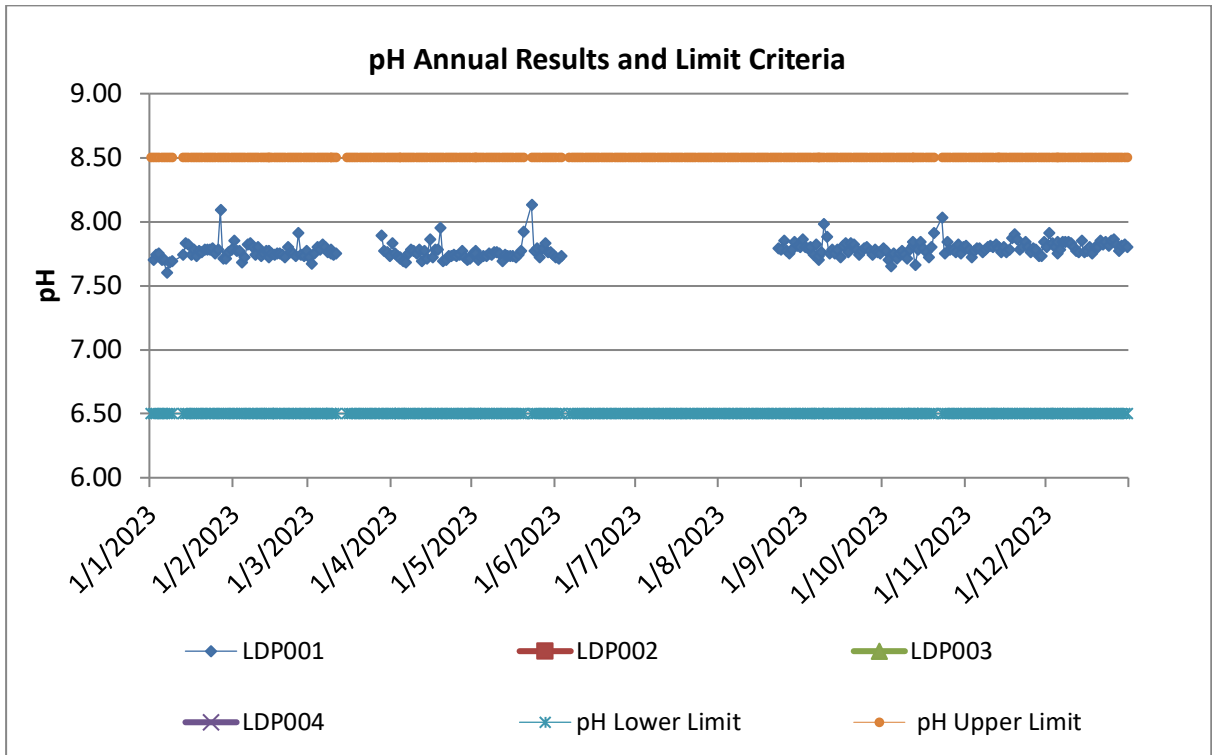
There were no exceedances of the water quality limits at LDP004 for the reporting period. Zero samples from LDP004 were analysed as there was no discharge during the reporting period. The average annual results at LDP004 are summarised in **Table 7-9**.

**Table 7-9: Water Quality LDP004**

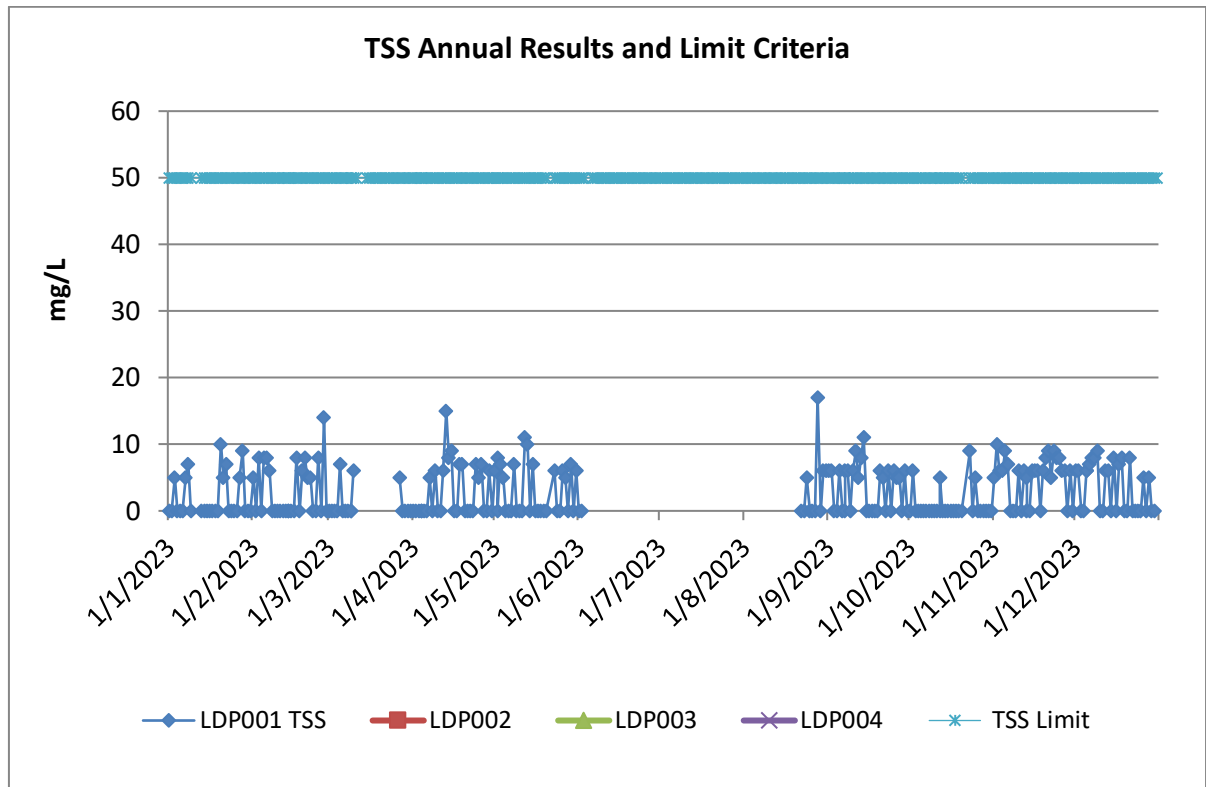
Pollutant	Unit of Measure	No of samples required by licence	No. of samples collected and analysed	Lowest sample value	Mean of samples	Highest sample value
Oil & Grease	milligrams per litre	0	0	-	-	-
pH	pH	0	0	-	-	-
Total suspended solids	milligrams per litre	0	0	-	-	-

**Table 7-10 LDP Annual Average and Long-Term Average**

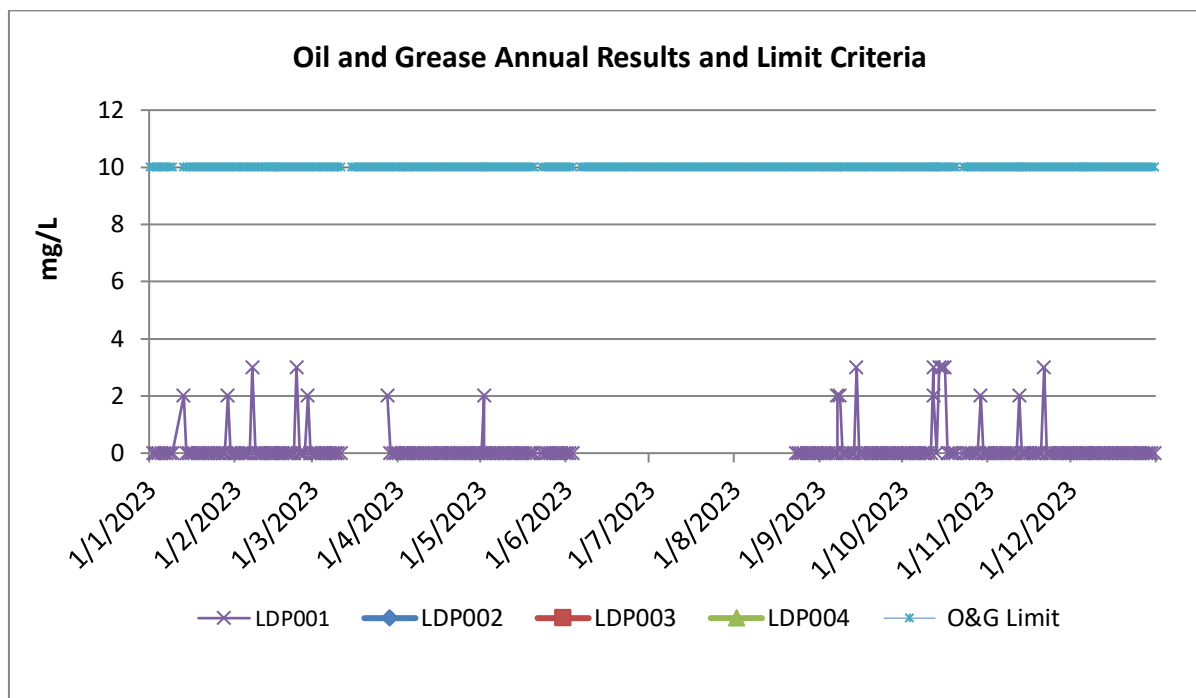
Site Location	pH		TSS		Oil Grease	
	Average	LTA	Average	LTA	Average	LTA
LDP001	7.78	7.82	2.84	2.04	0.16	0.15
LDP002	NA	6.97	NA	29.81	NA	0.13
LDP003	NA	7.55	NA	71.91	NA	2.18
LDP004	NA	7.64	NA	45.01	NA	0.05



**Figure 7-2 Annual pH Monitoring Results and Limit Criteria**



**Figure 7-3 Annual TSS Monitoring Results and Limit Criteria**



**Figure 7-4 Annual Oil & Grease Monitoring Results and Limit Criteria**

### 7.2.5 Data Interpretation

The results presented in **Table 7-4** are characteristic of the natural conditions of the area, particularly for Stockton, Moran’s, Mannering & Wye Creeks. Both Stockton and Morans Creek are the main drainage systems for the Mandalong area. Stockton Creek is located within the longwall mining area (LW1-16) and Morans Creek is also located within the longwall mining area (LW15-34). Both Mannering and Wye Creek are located within the Mandalong Southern Extension Area current (LW57-60) and future mining areas (LW39-43).

#### 7.2.5.1 Mandalong and Mandalong South Surface Site

Surface waters are tested for pH, TSS and EC and the annual and LTA results are summarised in **Table 7-4**. The Cooranbong Entry Site monitoring sites SW13, SW14, SW15, SW16 and SW17 were sampled monthly. The monitoring sites SW001, SW002, SW003, SW004, SW006, SW008, SW009, SW010, SW011, SW012, and SW018 were sampled quarterly during the reporting period. The Mandalong Southern Extension monitoring sites SWMP01, SWMP02, SWMP03, SWMP04, SWMP05, SWMP06, SWMP07 and SWMP08 were also sampled quarterly during the reporting period.

The EC (salt content) for the 2023 period shows a relatively consistent level compared with the long-term average for many sites.

The annual average TSS for 2023 are relatively low and are characteristic of natural surface water conditions in creeks. All sites had a 2023 annual average that was similar or of a lower level to the LTA. The highest annual average TSS for 2023 was recorded at 86.86 mg/L at SW015. The annual average was similar to the LTA (115.52mg/L).

All monitoring points recorded a pH annual average similar to the LTA. SW015 had the lowest pH annual average of 5.64 in 2023. The highest pH annual average during 2023 was 8.31 recorded at SW016.

#### 7.2.5.2 Surface Water Discharge Trends

The water quality results for LDP001 (**Table 7-10**) show the 2023 annual averages for pH, TSS and oil & grease are similar to the long term averages. LDP003 and LDP004 have limited

data for LTA to compare against. LDP001 has a consistent discharge water quality in 2023 as can be seen from **Figure 7-2**, **Figure 7-3** and **Figure 7-4**. The water quality results for LDP001 shows little variation. LDP002, LDP003 and LDP004 discharges occur as a result of high rainfall events and have greater variability.

### **7.2.5.3 Cooranbong Haul Road**

Monitoring for the surface water in the six sediment control dams on the haul road was conducted to determine compliance with the EPL limits prior to discharge. Prior to discharge the sediment control dams were treated by adding a flocculent to the water to remove suspended solids. The water quality of the haul road sediment control dams is required to meet the water quality discharge criteria detailed in the EPL and the Cooranbong Haul Road Surface Water Management Plan.

## **7.3 WATER BALANCE**

The 2023 water balance analysis was prepared by GHD (GHD, 2024b) in the report titled “*Mandalong Mine 2023 Annual Water Balance*”. The water balance for 2023 is shown in **Table 7-11**.

### **7.3.1 Water Supply, Use & Discharge**

The Mandalong Mine is connected to town water and sewer. Potable water for underground use is currently supplied by Hunter Water Corporation (HWC) via pipelines to the Cooranbong Entry Site and to the Mandalong Mine. Potable quality water is used underground in mining equipment as uncontaminated water is required for cooling systems on drive motors, in dust suppression sprays on miners and transfer points. The total potable water used in 2023 was 518 ML. A total of 455 ML was supplied via the Cooranbong Entry Site and Mandalong Mine Site to underground equipment. A total of 18.2ML was used on the surface within the Cooranbong CHP and bathhouse, 11.7 ML in the Mandalong Mine bathhouse and 10.7 ML for Mandalong Mine Surface operations.

The total potable water usage (518 ML) for 2023 is similar to the water usage in 2022 (485 ML). Potable water was primarily supplied to the longwall and underground equipment (longwall, continuous miners and conveyors) for coolant on motor transmissions and dust suppression.

GHD’s (2024b) water balance model reports 1118 ML was discharged in the 2023 reporting period from the Mandalong Mine, Mandalong South Surface Site, Cooranbong Entry Site and the Delta Entry Site. The volume of water discharged for the Cooranbong Entry Site at LDP001 is 1018 ML and LDP002 was 1 ML in the 2023 reporting period. 0 ML was discharged from LDP004 at the Mandalong South Surface Site and 0 ML from LDP003 at the Mandalong Mine in the 2023 reporting period.

**Table 7-11: 2023 Summary of Water Inputs and Outputs**

Element	2023 (simulated) (ML/year)
<b>INPUTS</b>	
Direct rainfall onto water storages	28
Catchment runoff	252
Potable water supply	518
Groundwater inflows	259
<b>TOTAL INPUTS (rounded)</b>	<b>1058</b>
<b>OUTPUTS</b>	
Evaporation	27
Spray irrigation	0
Sewage to HWC	12
Discharge through LDP001 (Cooranbong Entry Site)	1018
Discharge through LDP002 (Cooranbong Entry Site)	1
Discharge from Construction Dam (Cooranbong Entry Site)	25
Discharge from LDP003 (Mandalong Mine Access Site)	0
Discharge from Delta Entry Site	74
Discharge from LDP004 (Mandalong South Surface Site)	0
Extracted ROM coal moisture	54
<b>TOTAL OUTPUTS (rounded)</b>	<b>1211</b>
<b>CHANGE IN STORAGE</b>	
Cooranbong Underground Storage	-157
Surface water storages	3
<b>TOTAL CHANGE IN STORAGE (rounded)</b>	<b>-155</b>
<b>BALANCE</b>	
Inputs – outputs – change in storage	1

### 7.3.2 Mandalong Mine

Managing runoff from rainfall events is the only surface water management required at the Mandalong Mine Pit-Top. Clean water is diverted around the western area of the site. A dam has been constructed to capture this water. Clean water runoff from Mandalong Road, the M1 Motorway on-ramps and the car park has been diverted around the eastern perimeter of the site.

Water from all other areas of the surface is considered 'dirty' and is directed to sediment control systems. Surface and subsurface drainage directs dirty water to the sediment control system. This system comprises of a gross pollutant trap (GPT) and a sediment control dam. Water from the sediment control dam is used pumped into the Mandalong Mine underground workings. An oil water separator at the GPT removes hydrocarbons from potentially

contaminated runoff from the refuelling bay, oil store, workshop, washdown bay and equipment yard.

### **7.3.3 Cooranbong Entry Site**

Water from the hardstand area is directed to the 5 ML dam for treatment before discharge by an overflow culvert at LDP002. A dewatering pump installed in the 5 ML Dam allows low water levels in the dam to be maintained. Contaminated water from the workshop, equipment storage and washdown bay areas drain to an oil water separator used to remove hydrocarbons from wastewater.

Dirty water contaminated with coal fines from the CHP, conveyor gantries and ROM stockpile is directed to dedicated sediment control sumps to remove coarse fines material. Dirty water is then directed to the large GPT for further settlement of fines. Treated water from the GPT is then pumped to Sediment Dam 1 or directly underground. Sediment Dams 1 and 2 have a capacity of 7.6 ML.

A sediment control dam (ROM Stockpile Dam) and GPT were constructed in 2010 to capture and treat contaminated surface water runoff from the 100,000 T ROM coal stockpile. Sediment is captured in the ROM Stockpile Dam prior to flowing via pipeline into Sediment Dam 1 (via the Export Bin Sump).

### **7.3.4 Delta Entry Site**

Clean and dirty water systems have been constructed at the Delta Entry Site. Site runoff also utilises the existing stormwater infrastructure at the Wyee Coal Unloader, which includes clean water diversion drainage and two large dirty water settling ponds (9ML capacity) sufficient to treat contaminated water prior to discharge.

Another settling pond was constructed down slope of the decline portal for the pre-treatment of dirty water from the Delta Site. Sediment in runoff is settled out via the Final Sediment Sump and the decline settling pond prior to discharge into the large 9 ML settlings ponds.

### **7.3.5 Cooranbong Haul Road**

Clean and dirty water are separated along the haul road. Clean water is diverted by drains away from the haul road. Dirty water from the haul road and batters, is captured and treated within six sediment basins constructed along the haul road. Dirty water contained within the sediment basins is required to meet specific water quality criteria prior to discharge.

### **7.3.6 Mine Water Management**

#### **7.3.6.1 Mandalong Mine**

Water from the active underground mining area is pumped to a temporary settling area to reduce suspended solids. All water is then pumped to a goaf area (Cooranbong underground longwall void) in the north-west of the Cooranbong Entry Site. This void area has a significant storage capacity, and also acts as a primary settlement area for the removal of suspended solids. Dirty water from the Cooranbong Sediment Dams is also pumped or decanted via the existing infrastructure to the Cooranbong void to maintain low water levels in the surface dams.

Water in the Cooranbong void is then pumped to the surface through a borehole pump and overland to the Borehole Dam at the Cooranbong Entry Site. Water discharges via a surface pipeline directly to LDP001.

#### **7.3.6.2 Delta Site**

No mine water is discharged from the Delta Entry Site, as inseam water from the Delta underground headings and decline tunnel is pumped to the existing Mandalong Mine water system.



## 7.4 GROUNDWATER MANAGEMENT

### 7.4.1 Mandalong Mine

An annual review of the groundwater monitoring results was undertaken by GHD titled “Centennial Mandalong Annual Groundwater Monitoring Review 2023” (GHD, 2024b). An extensive groundwater monitoring network has been developed at Mandalong Mine with monitoring undertaken on many of the bores since August 1997. This program has been established to provide timely warnings of deviations from natural or background levels, so that if necessary, remedial measures and/or management strategies can be put in place.

The network consists of standpipe monitoring bores installed in alluvial and fractured rock groundwater sources. Locations were monitored monthly for groundwater level and limited water quality parameters (electrical conductivity and pH).

Details of the groundwater monitoring bores in the current groundwater monitoring program are summarised in Table 7-12. The location of the groundwater monitoring bores is shown in Figure 7-6 (GHD, 2024b).

**Table 7-12: Groundwater Monitoring Bore Details**

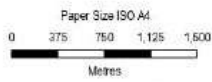
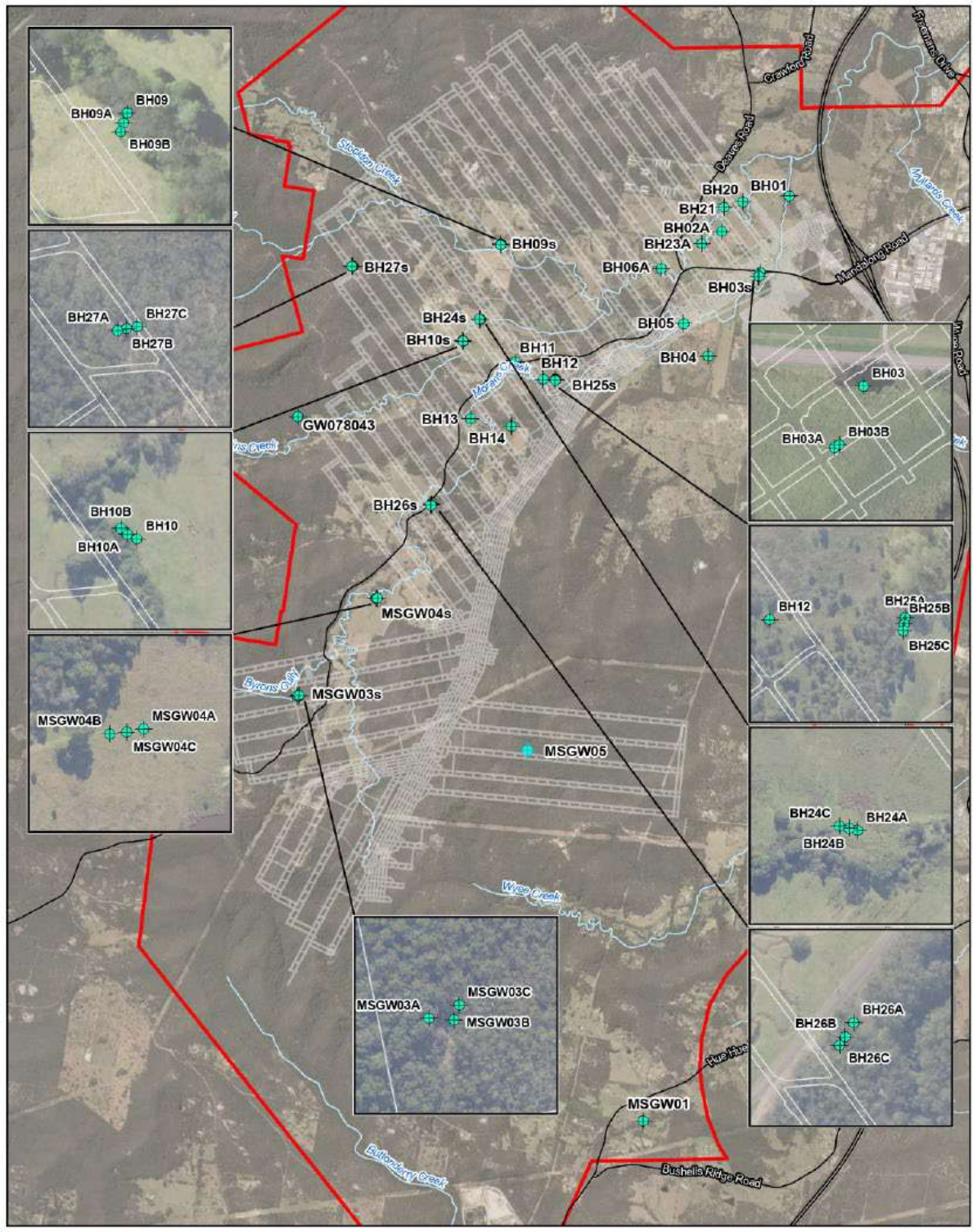
Bore	Monitoring Period	Lithology	Longwall Area
BH01	Aug 1997 – present	Alluvium	–
BH02A	Oct 2005 – present	Sandstone	LW3
BH03	Aug 1997 – present	Alluvium	–
BH03A	Nov 2005 – present	Alluvium	–
BH03B	Dec 2005 – present	Sandstone	–
BH04	Aug 1997 – present	Alluvium	–
BH05	Aug 1997 – present	Alluvium	–
BH06A	Nov 2005 – present	Sandstone	LW7
BH09	Aug 1997 – present	Alluvium	LW12
BH09A	Jun 2010 – present	Mudstone/sandstone	LW12
BH09B	July 2010 – present	Mudstone/sandstone	LW12
BH10	Aug 1997 – present	Alluvium	LW16
BH10A	Jun 2010 – present	Mudstone/sandstone	LW16
BH10B	Jun 2010 – present	Sandstone	LW16
BH11	Aug 1997 – present	Alluvium	LW15
BH12	Aug 1997 – present	Alluvium	LW14/15
BH13	Aug 1997 – present	Alluvium	LW18
BH14	Aug 1997 – present	Alluvium	LW17
BH20	Dec 2003 – present	Conglomerate	LW1
BH21	Dec 2003 – present	Conglomerate	LW2

Bore	Monitoring Period	Lithology	Longwall Area
BH23A	Jan 2006 – present	Mudstone	LW4/5
BH24A	Jun 2010 – present	Alluvium	LW15
BH24B	Jun 2010 – present	Sandstone	LW15
BH24C	Jun 2010 – present	Mudstone/sandstone	LW15
BH25A	Jun 2010 – present	Alluvium	LW14
BH25B	Jun 2010 – present	Sandstone	LW14
BH25C	Jun 2010 – present	Mudstone/sandstone	LW14
BH26A	Oct 2011 – present	Alluvium	LW22
BH26B	Oct 2011 – present	Sandstone	LW22
BH27A	Oct 2011 – present	Alluvium	LW18/19
BH27B	Oct 2011 – present	Sandstone	LW18/19
MSGW01	September 2011 – present	Alluvium	-
MSGW03A	September 2011 – present	Morans Creek alluvium	LW26
MSGW03B	September 2011 – present	Sandstone (Tuggerah)	LW26
MSGW03C	Sept 2011 – present	Conglomerate (Munmorah)	LW26
MSGW04A	Sept 2011 – present	Morans Creek alluvium	-
MSGW04B	Sept 2011 - present	Sandstone (Tuggerah)	-
MSGW04C	Sept 2011 – present	Conglomerate (Munmorah)	-
MSGW05	February 2023 – present	Alluvium	LW58
GW078043	August 2017 – present	Sandstone/Conglomerate	-

Source: (GHD, 2024b).

#### 7.4.2 Delta Entry Site

Groundwater monitoring at the Delta site was finalised at the completion of construction in December 2005. No groundwater is discharged at the Delta site. The Delta underground workings are limited to two Maingate roadways therefore, inseam groundwater make is minimal and is pumped via the existing inseam dewatering system to the Cooranbong longwall void area and discharged via LDP001 at the Cooranbong Entry Site.



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Groundwater Monitoring Bore Locations

FIGURE 3-1

Source: (GHD, 2024b)

Figure 7-5: Mandalong Mine Groundwater Monitoring Locations



### 7.4.3 Groundwater Levels

#### 7.4.3.1 Alluvial Groundwater Sources

In 2023, groundwater levels decreased at BH01, BH03, BH03A, BH04, BH05, BH09, BH10, BH11, BH12, BH25A, BH26A, and MSGW01, indicating below-average rainfall. MSGW03A, which is often dry due to its screening in shallow alluvium in the upper reaches of Morans Creek, saw groundwater levels rise from 30.5 m AHD in September 2023 to 34.5 m AHD in November 2023, though still within the historical range. MSGW05 was installed in February 2023, with water levels measured at 6.6 m from the top of the casing in March 2023. Despite a slight increase in groundwater levels in June, levels displayed a decreasing trend in September (Q3) and November (Q4) 2023, reflecting below-average rainfall. It's worth noting that this well recharges slowly following purging during monitoring. BH27A remained dry throughout 2023.

Trigger values for alluvial groundwater levels have been defined in the Water Management Plan. There were no trigger levels exceedances recorded in 2023.

#### 7.4.3.2 Fractured and porous rock aquifers

Monitoring wells BH02A, BH03B, BH06A, BH09A, BH09B, BH10A, BH10B, BH23A, BH24B, BH24C, BH25B, BH25C, BH26B, BH27B, MSGW03B, and MSGW04B are screened within the sandstone and siltstone layers of the Tuggerah Formation, approximately 120 to 230 meters above the coal seam. A consistent decline in groundwater levels has been observed at most of these sites following undermining activities. This decline suggests the development of discontinuous fractures within the rock overlaying the mine workings, a phenomenon consistent with predictions outlined in the EIS. While groundwater levels at MSGW03B increased from 26.14 m AHD in December 2020 to 28.15 m AHD in December 2022, an overall decrease was noted during the monitoring period. However, with the exception of BH24C and MSGW03B, the majority of locations have either stabilised or exhibited slight increases toward pre-mining levels three to five years post-undermining (GHD, 2024b)

Monitoring wells BH20, BH21, MSGW03C, and MSGW04C are equipped with screens positioned within the Munmorah Conglomerate, which lies beneath the sandstone of the Tuggerah Formation. These wells serve to monitor groundwater levels approximately 100 to 170 meters above the coal seam. Since early 2023, BH21 has been inactive, leading to a lack of recorded groundwater levels for the year. Throughout the monitoring period, groundwater levels at BH20 remained relatively steady, fluctuating between -44.2 meters and -47.2 meters AHD. In 2023, MSGW04C was sampled only once due to prevailing dry conditions. The purged groundwater level measured -8.0 meters AHD in November 2023, falling within the historical range.

The Water Management Plan establishes trigger levels for a subset of the porous and fractured rock monitoring wells. According to the modelling outlined in GHD (2016b), it was anticipated that monitoring wells situated within 230 vertical meters of the mining operations would experience drying due to excavation activities. Consequently, it was projected that groundwater levels would decrease below those of the majority of the porous and fractured rock wells.

No trigger value for MSGW04B have been developed based on a continually decreasing trend since monitoring commenced and the absence of stable criteria. Current levels at MSGW04B are already below the model predicted minimum. BH26B has exhibited a decreasing trend since September 2022, although groundwater levels persist above the trigger threshold. In

2023, MSGW03C was dry, aligning with model projections. While groundwater levels at MSGW03B dropped below the trigger threshold (as per model forecasts) for the first time in December 2020, they rebounded above the trigger level in the initial quarter of 2021. No instances of trigger exceedance were documented at MSGW03B in 2023. (GHD, 2024b).

#### 7.4.4 Groundwater Quality

##### 7.4.4.1 Alluvial Groundwater Sources

During the 2023 reporting period, pH within the alluvial aquifer spanned from acidic to neutral, ranging between 3.8 and 7.2, with the majority of measurements falling between 6 and 7. EC varied from freshwater conditions (<1,000 µS/cm) to saline levels surpassing 10,000 µS/cm.

Prior to 2015, bailing sampling methods were used, resulting in variability in alluvial groundwater salinity that was considered unrelated to mining activity (AGE 2014). However, since January 2015, alluvial groundwater monitoring locations have been sampled by low flow techniques (i.e., peristaltic pump) with purging continuing until pH and EC parameters show stabilisation. Consequently, variability within individual location datasets has generally reduced, however different locations continue to range from fresh to saline conditions (GHD, 2024b).

**Table 5.2** presents the site-specific trigger values for groundwater quality, as outlined in the WMP (Centennial 2022), which are in accordance with the LW57-60 Extraction Plan WMP for monitoring wells BH26A, MSGW03A, and MSGW04A (GHD, 2022b). Further details regarding the performance criteria can be found in the WMP (Centennial 2022).

Overall, No Stage 1 trigger exceedances (i.e., no instances of three consecutive exceedances of the trigger value) were observed for the alluvial monitoring bores BH26A, MSGW03A, and MSGW04A, nor were there any exceedances of the 0/100th percentile trigger (GHD, 2024b).

##### 7.4.4.2 Fractured and porous rock groundwater sources

Rock aquifer groundwater is generally characterised by a pH ranging neutral to slightly alkaline (7 to 8 pH units). EC values generally ranged from brackish to saline (6,000 to 10,000 µS/cm), consistent with the low potential for beneficial use of groundwater near Mandalong Mine.

Site specific trigger values for groundwater quality were updated in the draft LW57-60 Extraction Plan - Water Management Plan for BH26B, MSGW03B, and MSGW04B. The following Stage 1 trigger exceedances were identified in 2023:

- pH at MSGW03B has exceeded the 20th percentile trigger on three occasions over the last three quarters. Visual analysis reveals a declining pH trend at MSGW03B, currently falling slightly below its historical range. This mirrors a past trend observed at MSGW04B from 2018 to 2019, though pH levels have since stabilised there.

- pH at BH26B has exceeded the 20th percentile pH trigger on three consecutive occasions in Q3 2024, while also exhibiting one exceedance of the 0th percentile pH trigger during the same quarter. Given the absence of any exceedance in Q4 2023, no additional investigation is warranted for BH26B.

- pH at MSGW04B has exceeded the 0th percentile trigger on one occasion in Q4 2023. The groundwater level at MSGW04B has exhibited a rising trend since May 2020. Given that mining activities in the area concluded several years ago, the decline in pH is likely attributable to the ongoing recovery of groundwater levels post-mining and the inherent geological variability. It is advisable to continue monitoring MSGW04B.



Overall, there were no trends of concern identified during 2023 that may result in a change in the beneficial use category of groundwater (GHD, 2024b).

## 8 ANNUAL REHABILITATION REPORT

In 2023 a Rehabilitation Management Plan (RMP) was prepared in accordance with the Mining Exploration and Geoscience – Resources Regulator’s (RR) Form and Way: Rehabilitation Management Plan for Large Mines (RR, 2021). The RMP was also prepared to satisfy Schedule 3, Condition 33A of SSD 5144 which requires Mandalong to prepare and implement a Rehabilitation Management Plan in accordance with the conditions imposed on mining leases associated with the mine under the NSW *Mining Act* 1992.

As described in the RMP, the conceptual long term mine rehabilitation objective is to provide a low maintenance, geotechnically stable and safe landform. Specific conceptual long-term objectives include:

- Prevent public access to former underground workings;
- Re-establishing land disturbed by the operations of Centennial Mandalong to an appropriate final land use;
- Provide habitat for fauna and corridors for fauna movement within the final landform;
- Monitor rehabilitation success in terms of physical and biological parameters;
- Relinquishment of the surface leases as rehabilitation objectives are achieved; and
- Compliance with appropriate company and regulatory policies and guidelines.

Post-mining land use options for Mandalong (MMAS and MSSS) were assessed in the Mandalong Southern Extension Project Decommissioning and Rehabilitation Strategy which was prepared for the Mandalong Southern Extension Project EIS (SLR, 2013). Post-mining land use options for the CES were assessed in the Northern Coal Logistics Project Decommissioning and Rehabilitation (SLR, 2014) which was prepared for the Northern Coal Logistics Project EIS.

It is intended to re-develop the MMAS and CES for an industrial based land use(s). The option of leaving this infrastructure in the final landform will be discussed in consultation with RR and after discussions with potential buyers have been held.

The intended post-mining land use for the MSSS is native bushland and pasture commensurate with the pre-mining conditions.

Post-mining land use for the DES will be addressed in consultation with Delta Electricity with the intended post-mining land use being native bushland commensurate with adjacent vegetation.

As Mandalong is an underground mine, the majority of the Colliery Holding will not be disturbed. The exception to this might be areas impacted by subsidence which will be addressed and managed on an ongoing basis in accordance with an approved SMP or Extraction Plan.

### 8.1 PROGRESSIVE REHABILITATION AND COMPLETION

Since the Mandalong Mine is an underground mine, the relatively small disturbance footprint associated with surface infrastructure means that there are limited opportunities for progressive rehabilitation. To what extent is appropriate, rehabilitation will be undertaken progressively on areas that cease to be used for mining or mining related activities as soon as is reasonably practicable.

Forecast rehabilitation activities include:

- Maintenance and monitoring of rehabilitated areas that were disturbed during the construction of the MSSS and access road;
- Progressive rehabilitation of exploration and/or groundwater monitoring sites;

- Rehabilitation of areas affected by subsidence, as required, in accordance with an approved SMP or Extraction Plan;
- Maintenance and monitoring of the VAM-RAB offset area which was established in 2012 at the Mandalong Mine;
- Maintenance and monitoring of the MSSS and TL24 offset areas; and
- Maintenance and monitoring of areas of existing rehabilitation.

A summary of the current disturbance and rehabilitation status at the end of the annual reporting period is provided in **Table 8-1**.

**Table 8-1: Status of disturbance and rehabilitation at end of reporting period**

Annual reporting period	1 January 2023 to 31 December 2023
Total disturbance footprint – surface Disturbance	43.89
Underground mining area (hectares)	0
Total active disturbance (hectares)	38.32
Rehabilitation – land preparation (hectares)	0.24
Ecosystem and land use establishment (hectares)	0.59
Ecosystem and land use development (hectares)	0 (ecosystem and land use development) 24.81 (retained infrastructure)
Rehabilitation completion (hectares)	0

## 8.2 MANDALONG MINE REHABILITATION

The majority of Mandalong Mine Access Site has been rehabilitated following the completion of construction activities in 2005. Rehabilitated sections of the Mine’s surface area are well established and have provided vegetation cover to effectively minimise the potential for erosion.

Centennial Mandalong received approval in 2011 (DA97/800 Modification 7) for the trial installation of a ventilation air methane regenerative afterburner unit (VAM-RAB) that would remove and breakdown the exhaust methane. Installation of the VAM-RAB unit in 2012 necessitated clearing of some native vegetation. Two endangered ecological communities (EEC) listed in Schedule 3 of the NSW *Threatened Species Conservation Act 1995* were included in the areas to be cleared. These were: Swamp Sclerophyll Forest (SSF) on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions; and River-Flat Eucalypt Forest (RFEF) on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions.

DA97/800 Condition 76A included a requirement for a 1.25 hectare rehabilitation off-set area to be established on cleared land adjoining the VAM-RAB construction site. These EEC were represented by communities described in the regional vegetation mapping and classification (NPWS 2000) as: MU37 Swamp Mahogany Paperbark Forest (SSF); and MU38 Redgum – Rough-barked Apple Swamp Forest (RFEF).

An ecology survey (Hunter Eco, 2011) prepared for the VAM-RAB project application described the area to be rehabilitated as mostly dominated by weeds. This being the case, active regeneration was required and this was commenced in January 2012. Further to the requirement to rehabilitate, DA97/800 Condition 76A also requires that the progress of the rehabilitation be monitored annually for five years. This monitoring was conducted by Hunter Eco in December 2023 and is described in **Section 6.5.9** of the Annual Review.

### 8.2.1 Longwall Mining Area

The surface areas above the completed longwall mining panels are inspected as per the schedules prescribed in the LW25-29, LW30-31, LW32, LW34 and LW57-60 Extraction Plan Water Management Plans (WMP). The LW25-29, LW30-31, LW32, LW34 and LW57-60 Extraction Plan WMPs require that the floodpaths are to be inspected every six months or after a flood event. During the course of these inspections observations are made on the progress of remedial measures implemented to minimise subsidence related effects (refer [Table 6-25](#)).

An update on ponding and subsidence remediation completed in 2023 is provided in [Table 6-25](#).

### 8.2.2 Exploration Sites

Eleven surface exploration drill sites were prepared in 2023. Progressive rehabilitation of exploration sites will continue in 2024.

### 8.2.3 Delta Entry Site

Construction of the Delta coal clearance system was largely completed in 2005 and rehabilitation of the site was completed in 2006. Rehabilitation at the Delta Entry Site was inspected in 2023 to assess the effectiveness of the works to stabilise disturbed areas onsite. The direct seeding rehabilitation methods used have been successful in establishing a substantial area of the site with pasture and tree groundcover. Ground cover on the direct tree seeded areas is approximately ninety percent similar to those recorded in 2022. Ninety-five percent ground cover has been achieved in rehabilitated pasture seeded areas. The area is slashed to maintain access to infrastructure and as part of the asset protection zone.

### 8.2.4 Cooranbong Entry Site

A total of 3.9 hectares were disturbed for the construction of the upgrades to the CHP and haul road at the Cooranbong Entry Site in 2009. Construction activities were completed in May 2010 with all disturbed areas rehabilitated by the Contractor shortly after. No further rehabilitation works were undertaken in 2023.

### 8.2.5 Cooranbong Haul Road

The haul road construction resulted in approximately 18 hectares of disturbance. Of this 3.9 hectares of disturbed land associated with the CHP upgrades (stockpile and conveyor) and haul road are located on Mandalong Mine's Mining Lease. 1.25 hectares of disturbed area not occupied with haul road and CHP infrastructure was rehabilitated in 2010. The remaining areas are located on the Newstan Colliery Mining Lease CCL764. Of this, nine hectares along the haul road was rehabilitated in 2009. Six hectares of land will not be rehabilitated as it is occupied by the haul road infrastructure.

As per the requirement of the Mandalong Haul Road Landscape and Rehabilitation Plan, the Mandalong Environment & Community Officer audited the rehabilitation on the haul road in November 2023. The audit assessment required the following issues be addressed: -

- *An assessment of surface and slope stability.*
- *Properties of the soil or root zone media (such as chemistry, fertility and water relations).*
- *Plant community structural attributes (such as cover, woody species, density and height).*
- *Plant community composition (such as presence of desirable species, weeds).*
- *Selected indicators of ecosystem functioning analysis (such as soil microbial biomass).*

The 2023 audit focused on identifying sites where remedial action or maintenance is required. The inspection was completed by surveying the length of the Haul Road to follow up on areas previously identified as needing work, and to identify additional areas requiring attention.

The six reference sites were inspected, and relevant actions were recorded. The highest priorities included maintenance of sediment and erosion controls along the Haul Road drains and at the dam inlets.

The audit provides a useful assessment of baseline rehabilitation completed to date on the haul road following the completion of all construction activities in 2011. In general, rehabilitated areas of the haul road are well established and native vegetation dominates the strata. Weed management contractors are scheduled to continue rehabilitation practices on the Haul Road in 2024. The maintenance and effectiveness of the haul road rehabilitation will be assessed in 2024 and reported in the next Annual Review.

### **8.2.6 Mandalong South Surface Site**

The construction of the access road for the MSSS was completed in 2018. The clearing of the MSSS was completed in 2018, with shaft sinking completed in late 2021. The construction of the access road and clearing of the MSSS resulted in approximately 11.3 hectares of disturbance.

The areas disturbed by the construction of the access road were stabilised in 2018 with the application of hydro-mulch and bark-blower mulch / seed which was applied to the road batters. Hydro-mulch and bark-blower mulch was also applied to the batters of the MSSS in 2018.

Shaping earthworks and capping were completed for the MSSS stockpile in 2022. The application of hydro-mulch and pasture seed was applied to the MSSS stockpile in 2022 following the completion of earthworks.

The weekly environmental construction inspection procedure (WP-7154) has been updated to include the rehabilitation areas around the access road, MSSS and the main stockpile area. The monitoring procedure includes a requirement for an assessment of new or increased erosion (including batters), growth improvement, weeds and remedial work if required.

Maintenance and effectiveness of the rehabilitation will be assessed in 2024 and reported in the next Annual Review.

### **8.2.7 Invertebrate Pest Management**

There were no reports of invertebrate pests within the Mandalong operations and rehabilitation areas in 2023 and therefore no invertebrate pest management was undertaken during the reporting period.

## **8.3 REHABILITATION MONITORING**

Centennial are required to conduct rehabilitation, following disturbance, as soon as practicable in accordance with rehabilitation objectives outlined in Schedule 3, Condition 31, and Condition 32 of the Development Consent (SSD-5144).

### **8.3.1 Mandalong South Surface Site**

RPS was engaged to undertake annual monitoring of rehabilitation sites at MSSS. This involved utilising the Ecosystem Function Analysis (EFA) and Biodiversity Assessment Methodology (BAM) to assess ecosystem function of control (C) and rehabilitation (R) sites within MSSS. Field surveys were undertaken on 24 and 25 August 2023.

Existing Control and rehabilitation locations (two plots per treatment) were revisited. An additional rehabilitation and control plot (one plot per treatment) was installed to increase the statistical rigour of the experimental design. A total of three paired monitoring sites were sampled each comprising an impact and control transect. These sites were permanently marked in the field using surveyors pegs and flagging tape for future repeat monitoring.



Rehabilitation sites exhibited generally lower Landscape Function Analysis (LFA) and BAM Scores than control sites, indicating that further rehabilitation (both passive and active) is required before pre-mining conditions are achieved. The existing rehabilitation plots poorly represent PCT 3234 (cleared community) and will not rehabilitate without further intervention and consequent follow-up (RPS, 2024f).

To improve the trajectory of rehabilitation toward analogous conditions, the following actions have been recommended:

- Weed control to be undertaken in all Rehabilitation sites. Specific focus should be given to abundant HTWs, which includes dense *Chloris gayana* (Rhodes Grass) and *Andropogon virginicus* (Whiskey Grass), and *Eragrostis curvula* (African Lovegrass). Control of these should be the highest management priority as these exotic grasses smother native species and suppress regeneration;
- Native undergrowth is to be established and or promoted to further stabilise soil surface. This is most pertinent at rehabilitation site R1, where a native understory and grasses are entirely lacking. Seeding and/or planting of native grasses and understory species is recommended, especially in areas where native vegetation is lacking, to accelerate the succession toward a more natural state; and
- Further tube stock planting of canopy species is required to improve the trajectory toward a more natural vegetation formation state (i.e., open woodland), with these trees consistent with adjacent plant community types (e.g., *Corymbia maculata* [Spotted Gum] or *Eucalyptus umbra* [Broad-leaf White Mahogany]) (RPS, 2024f).

Further rehabilitation monitoring at Mandalong South Surface Site will be completed in 2024 and reported in the next Annual Review.

### 8.3.2 Delta Entry Site

All buildings at the Delta Entry Site are associated with the coal conveying system and as such are a permanent fixture. The buildings associated with the construction of the site were decommissioned and removed prior to the site being rehabilitated in 2006. No decommissioning of buildings occurred at the Delta Entry Site in 2023 and as such no rehabilitation of buildings was undertaken.

New portable buildings were installed in 2018 at the Delta Entry Site which included office and lunchroom facilities.

### 8.3.3 Cooranbong Entry Site

To ensure continuation of coal handling operations and mine support infrastructure, surface buildings and mine related infrastructure have been retained at the Cooranbong Entry Site. The Cooranbong Entry Site, CHP and supporting infrastructure were used in 2023 to supply coal to the Eraring Power Station and to Newstan.

No buildings or infrastructure at the Cooranbong Entry Site were removed or decommissioned in 2023.

## 8.4 REHABILITATION TRIALS AND RESEARCH

### 8.4.1 Use of Analogue Sites

Data from analogue rehabilitation sites is an integral part of the monitoring procedure throughout the monitoring process. The purpose of analogue sites is to provide a reference against which to document the progress of rehabilitation towards reaching ecosystem health, structure and composition consistent with undisturbed areas.

In 2023, Centennial Mandalong engaged RPS to select and monitor analogue sites to assess whether they are suitable in the context of the proposed final land use and to suggest the species that will be appropriate for revegetation.

Analogue sites were established within undisturbed areas in the vicinity of the proposed Mandalong South Surface Site (MSSS) corresponding with the intended post mining land use of native bushland, commensurate with pre-mining conditions.

The majority of the Mandalong Mine Access Site and the Cooranbong Entry Site are proposed to be retained as infrastructure and therefore no reference monitoring in the vicinity is deemed necessary.

Specific analogue sites were selected based on the following general criteria:

- Contain vegetation types similar to the rehabilitation sites;
- Secure from future mining related disturbance; and
- Contain vegetation and conditions suitable as a basis for rehabilitation performance criteria.

The monitoring results from analogue sites will provide the basis for comparison to measure the success of the rehabilitation against the relevant closure criteria. Results of analogue site monitoring will be reported in future Annual Reviews.

#### **8.4.2 Mandalong Mine VAM-RAB Offset Area**

Refer to **Section 6.5.9** of the Annual Review for details on the Mandalong Mine VAM-RAB Offset Area.

#### **8.4.3 Mandalong South Rehabilitation Monitoring**

Refer to **Section 8.2.6** of the Annual Review for details on the Mandalong South Surface Site Rehabilitation Monitoring.

#### **8.4.4 Land Management Strategy for the MSSS and TL24 Offset Areas**

Refer to **Section 6.5.7** of the Annual Review for details on the Mandalong Mine Land Management Strategy for the MSSS and TL24 Offset Areas.

## 9 COMMUNITY CONSULTATION

Mandalong Mine consults with the community through forums such as the Mandalong Mine Community Consultative Committee and community organised events.

Meetings of the Mandalong Mine Community Consultative Committee (CCC) were held in February, June and October 2023. Representatives of the Mandalong community, appointed community representatives, relevant government organisations and company representatives attended the meetings. A detailed presentation was provided to attendees at each CCC meeting on the Mine's production, geological update, subsidence results, environmental monitoring, Extraction Plan update, upcoming projects and sponsorship.

Additional agenda items discussed in 2023 included the MSSS noise management, operational and exploration activities, land management and subsidence remediation, flood modelling, revised DPE CCC guidelines and requirements, community fund updates, other topics included the condition of Mandalong Road, allocation of State funding for a new fire shed and new developments in the Morisset area.

### 9.1 EXTRACTION PLAN CONSULTATION

Extensive community consultation with landowners in the Mandalong mining area is undertaken for the purpose of monitoring and assessing subsidence effects on private properties. In general, the Mandalong Mine community consultation has included:

- Community consultation in line with the Stakeholder Engagement Strategy;
- Individual landowner notification and consultation associated with the implementation of Extraction Plans LW24-24A, LW25-29, LW30-31, LW32, LW34 and LW57-60 and their associated PSMP's;
- Consultation and general communication with all relevant government agencies and infrastructure owners during the implementation of the Extraction Plans LW24-24A, LW25-29, LW30-31, LW32, LW34 and LW57-60;
- One-month mining notifications were provided to landowners prior to mining beneath their property, with follow-up meetings and inspections undertaken.
- Individual landowner consultation and implementation of PSMPs during mining of Longwalls 34 and 57;
- Individual landowner consultation for rehabilitation of remnant ponding, flooding and subsidence related repairs to property (LW19-32);
- Commencement of landowner consultation for Extraction Plan LW39-43 in the eastern longwall domain and the associated biodiversity and cultural heritage monitoring requirements.
- Three meetings of the CCC delivered updates on the status of Development Consent modifications, Extraction Plan approvals, monitoring and subsidence management on Centennial property, private property and public infrastructure.
- Ongoing consultation with relevant stakeholders on the development and implementation of Infrastructure Management Plans including Public Roads (LMCC), powerlines (Ausgrid), communication lines (Telstra) and high voltage transmission lines (TransGrid).

## 9.2 COMMUNITY SPONSORSHIP

The Mandalong Mine continues to support the local community through various sponsorship avenues to the following community activities, groups and associations in 2023 –

- Local Participation in the International Children Games South Korea
- Avondale School
- Big D's Foundation
- Cooranbong Public School
- Dora Creek RLFC
- Heritage College Spring Fair
- Mates in Mining
- Meals on Wheels Wellness Program
- Morisset Show
- Morisset Rotary Fair
- Lake Macquarie School Environment Awards Program
- Southern Lakes United Football Club
- Southlake's Mens Shed
- St. John Vianney Primary School Awards Program
- Westlake's Aboriginal Elders Inc
- Wyee Point Swim Club

## 9.3 COMMUNITY COMPLAINTS

Twenty-seven community complaints were received in 2023, indicating a decrease compared to the previous reporting period. Twenty-one of the complaints were related to noise from the MSSS ventilation fans, with six complaints received in 2023 regarding noise from the Cooranbong Entry Site.

**Table 9-1: Record of annual community complaints for 2019 to 2023**

Community Complaints						
Year	Air	Water	Noise	Waste	Other	Total
2019	0	0	3	0	0	3
2020	0	0	5	0	2	7
2021	0	0	83	0	0	83
2022	0	0	92	0	0	92
2023	0	0	27	0	0	27

**Figure 9-1** shows an increase in the number of community complaints received since 2018 which are associated with the construction and operation of the MSSS. Twenty-seven noise

complaints were received in 2023, showing a significant decrease in noise complaints compared with the previous reporting periods.

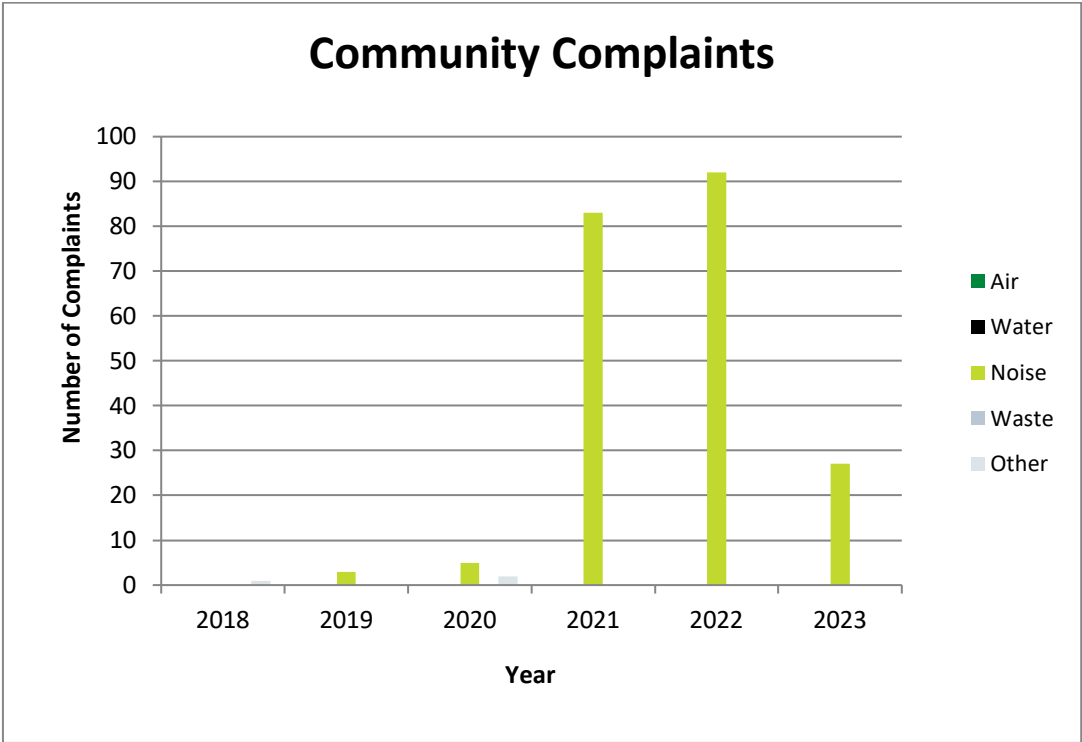


Figure 9-1: Annual Community Complaints



## 10 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit (IEMA, 2022) of Mandalong’s operations was completed by Integrated Environmental Management Australia (IEMA) in June 2022. The audit report is publicly available on the Centennial Mandalong website.

The Independent Environmental Audit (IEA) completed by IEMA reviewed the consents and associated Statement of Commitments, Environment Protection Licence, mining tenements, Environmental Management Plans, and the status of previous IEA recommendations. In general, the site was considered largely compliant with only one administrative and nine low-level non-compliances identified. A summary of the audit outcomes is provided in **Table 10-1** (IEMA, 2022)

**Table 10-1: Audit Compliance Summary**

Compliance Status	SSD-5144	SSD-5144 SOC	DA97/800	DA97/800 SOC	DA35-2-2004	EPL 365	ML 1443	ML 1543	ML 1553	ML 1722	ML 1744	ML 1793	MPL 191	Total
<b>Compliant</b>	72	80	79	30	9	50	17	5	6	9	5	4	19	<b>385</b>
<b>Not triggered</b>	14	14	45	14	9	14	17	10	13	2	5	3	16	<b>176</b>
<b>Admin Non-Compliance</b>	0	0	0	0	0	0	1	0	0	0	0	0	0	<b>1</b>
<b>Low Non-Compliance</b>	3	1	0	0	0	5	0	0	0	0	0	0	0	<b>9</b>
<b>Medium Non-Compliance</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>High Non-Compliance</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>Not Verified</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>Observation</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	<b>0</b>
<b>Note</b>	1	0	2	0	5	12	2	2	5	1	4	2	2	<b>38</b>
<b>Total</b>	<b>90</b>	<b>95</b>	<b>126</b>	<b>44</b>	<b>23</b>	<b>81</b>	<b>37</b>	<b>17</b>	<b>24</b>	<b>12</b>	<b>14</b>	<b>9</b>	<b>37</b>	<b>609</b>

The Mandalong Mine has prepared an Action Plan in response to the non-compliances and recommendations listed in the 2022 Independent Environmental Audit. The Action Plan was provided to DPE on 27 June 2022 and an updated version is included in **Appendix 1**.

Correspondence from DPE dated 21 September 2022 stated that the Department considered the Independent Environmental Audit report generally satisfies the reporting requirements of the consent. DPE requested that a status update on the IEA Action Plan is included in future Annual Reviews.

The next Independent Environmental Audit of the Mandalong Mine operations in accordance with SSD-5144 Schedule 6, Condition 13 is required to be commissioned prior to 31 March 2025.

## 11 NON-COMPLIANCES DURING THE REPORTING PERIOD

Table 11-1: Non-Compliance 1

<b>Nature of the incident/non-compliance</b>	EPL 365 L5.1 – Noise Limits SSD-5144 Schedule 3 Condition 2 – Operational Noise Criteria
<b>Date of incident / non-compliance (if known; if not known state not known)</b>	30 June 2023
<b>The location of the incident/ non-compliance (include a figure if appropriate), if known</b>	Mandalong Mine
<b>Detail the cause of the incident/non-compliance</b>	At Mandalong Mine monitoring point M6 (Crooks Road) during the night, a 5dBa sleep disturbance criteria exceedance was recorded. The source was identified as horn noise from a vehicle entering the mine portal at 12:02 am on June 30, 2023.  Notification of the non-compliance was provided to the EPA, DPE and NSW Resources Regulator on 8 August 2023 following receipt of the noise monitoring results.
<b>Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance</b>	There were no community complaints received by Centennial Mandalong in relation to the noise criteria exceedance. There have not been any noise related complaints in relation to the MMAS operations since 2011, with no previous complaints received regarding vehicle horn noise.  Centennial Mandalong notified the two landowners / sensitive receivers associated with the noise monitoring location M6 as required by Condition 1(a) of Schedule 5 of SSD-5144.
<b>Detail action that has been, or will be, taken to prevent recurrence of the incident/ non-compliance</b>	Centennial Mandalong requires that operators of vehicles use their horn once when entering and exiting the MMAS underground portal. This measure is implemented as on-site safety measure for all vehicles to prevent vehicle collisions.

**Table 11-2: Non-Compliance 2**

<b>Nature of the incident/non-compliance</b>	Failure to submit the Rehabilitation Cost Estimate and Annual Rehabilitation Report and Forward Program by the due date
<b>Date of incident / non-compliance (if known; if not known state not known)</b>	10 October 2023
<b>The location of the incident/ non-compliance (include a figure if appropriate), if known</b>	Mandalong Mine
<b>Detail the cause of the incident/non-compliance</b>	<p>On 10 October 2023, Centennial Mandalong Pty Ltd was notified of the commencement of an investigation into the alleged contravention of 2 breaches of the Regulation against titles CCL 762 (1973), ML 1443 (1992), ML 1543 (1992), ML 1553 (1992), ML 1722 (1992), ML 1744 (1992), ML 1793 (1992), MPL 191 (1973).</p> <p>These contraventions were for the 2022 and 2023 Forward Program against Clause 13(1) of Schedule 8A of the Regulation requiring a forward program to be developed and Clause 15(2) requiring its submission to the Secretary before 60 days after the last day of each annual reporting period (or a later date as approved by the Secretary).</p> <p>In relation to the 2022 contravention, Centennial Mandalong failed to submit the 2022 forward program to the Regulator as required.</p> <p>In relation to the 2023 contravention Centennial Mandalong submitted the 2023 forward program on 4 May 2023 after the due date although the Regulator Portal issues are acknowledged as a contributing factor to this late submission. The Rehabilitation Cost Estimate (RCE) required as a component of the forward program was submitted on 6 October 2023. The late submission of the RCE component means the forward program requirement was not satisfied until 6 October 2023, later than the 31 March 2023 due date.</p>
<b>Detail action that has been, or will be, taken to mitigate any adverse effects of the incident/ non-compliance</b>	<p>Both contraventions of s.378D of the Mining Act 1992 were sustained and Mandalong was issued an Official Caution on 22 December 2023.</p> <p>All required documents have now been submitted to the Resource Regulator</p>

## 12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Table 12-1: Forecast Operations for 2024

<b>Centennial Mandalong</b>
<p>Implement Environmental Management Plans required by SSD-5144.</p> <p>Implement LW30-31, LW32, LW34 and LW57-60 Extraction Plan Management Plans</p> <p>Prepare LW39-43 Extraction Plan for submission to DPE.</p> <p>Continue baseline monitoring for LW39-43 and LW44-46 Extraction Plan</p>
<b>Mandalong Mine Access Site</b>
<p>Continue operating Mandalong Mine Gas Engines.</p>
<b>Cooranbong Entry Site</b>
<p>Nil major targets for 2024.</p>
<b>Delta Entry Site</b>
<p>Nil major targets for 2024.</p>
<b>Mandalong South Surface Site</b>
<p>Nil major targets for 2024.</p>

## 13 BIBLIOGRAPHY

- Centennial. (2023b). *Mandalong Mine Annual Review - March 2023*.
- Centennial Mandalong. (2023a). *Floodpath Condition Report 2023*.
- Department of Planning & Environment. (2015). *Post Approval Guidelines: Independent Audits*.
- Ditton Geotechnical Services. (2018). *Subsidence Predictions and Impact Assessment for LW25 to 31 at the Mandalong Mine - MAN-003/1*.
- Ditton Geotechnical Services. (2019a). *Subsidence Assessment for the Proposed Modification to LW25 - MAN-003/4*.
- Ditton Geotechnical Services. (2020). *Subsidence Predictions and Impact Assessment for SSD-5144 Mod 9 Submissions Report MAN-005/1*.
- Ditton Geotechnical Services. (2021). *Subsidence Predictions and Impact Assessment for Proposed LW30 and 31 - MAN-005/2*.
- Ditton Geotechnical Services. (2021). *Subsidence Predictions and Impact Assessment for Proposed LW32*.
- Ditton Geotechnical Services. (2022). *Subsidence Assessment for the Proposed LW34 Extraction Plan at the Mandalong Mine - MAN-007/04*.
- Ditton Geotechnical Services. (2023). *Subsidence Assessment for the Proposed LW57-60 Extraction Plan at the Mandalong Mine - MAN-007/2*.
- GHD. (2019b). *Muddy Lake Green & Golden Bell Frog Monitoring - Summer 2018/19 Monitoring Report*.
- GHD. (2021b). *Centennial Mandalong Annual Groundwater Monitoring Review 2020*.
- GHD. (2021c). *Muddy Lake Green & Golden Bell Frog Monitoring - Summer 2020-2021*.
- GHD. (2022b). *Centennial Mandalong Annual Groundwater Monitoring Review 2021*.
- GHD. (2022d). *Northern Region - Noise Management Plan*.
- GHD. (2022e). *Muddy Lake Green & Golden Bell Frog Monitoring - Summer 2021-22*.
- GHD. (2023). *Muddy Lake Green & Golden Bell Frog Monitoring - Summer 2022-23*.
- GHD. (2023b). *Mandalong Mine - 2022 Annual Water Balance*.
- GHD. (2024a). *Mandalong Mine - 2023 Annual Water Balance*.
- GHD. (2024b). *Mandalong Mine Annual Groundwater Monitoring Review - 2023*.
- GSS Environmental. (2012). *Cooranbong Distribution Project Environmental Assessment*.
- Hunter Eco. (2011). *Mandalong Mine Ventilation Air Methane Abatement Demonstration Project - Ecology Report*.
- Hunter Eco. (2019). *VAM-RAB Site Vegetation Rehabilitation Monitoring Year 7*.
- Hunter Eco. (2020). *VAM-RAB Site Vegetation Rehabilitation Monitoring - Year 8 Mandalong Mine*.
- Hunter Eco. (2021). *VAM-RAB Site Vegetation Rehabilitation Monitoring - Year 9 Mandalong Mine*.
- Hunter Eco. (2023a). *VAM-RAB Site Vegetation Rehabilitation Monitoring - Report Year 10*.
- Hunter Eco. (2023b). *VAM-RAB Site Vegetation Rehabilitation Monitoring - Report Year 11*.
- IEMA. (2022). *Mandalong Mine - Independent Environmental Audit*.



MCW Environmental. (2019). *Independent Environmental Audit - Mandalong Mine & Mandalong South Extension Project*.

RPS. (2017b). *Archival Recording - Landing Skid 2 Mandalong South*.

RPS. (2018b). *Heritage Management Plan for LW25-31 Extraction Plan*.

RPS. (2020b). *LW22-24A, LW25-31 & LW32-37 Aquatic Ecology Assessment*.

RPS. (2022a). *Terrestrial Biodiversity Monitoring Report : LW22-24A*.

RPS. (2022b). *Terrestrial Biodiversity Monitoring Report : LW25-29*.

RPS. (2022c). *Terrestrial Biodiversity Monitoring Report : LW30-31*.

RPS. (2022d). *LW22-24A, LW25-29, LW30-31, LW32, LW39-43. Mandalong Extraction Plan Areas - Aquatic Ecology Assessment Spring 2021*.

RPS. (2022e). *Mandalong Land Management Strategy Monitoring 2021*.

RPS. (2023a). *LW25-29 Annual Monitoring Report*.

RPS. (2023a). *LW25-29 Annual Monitoring Report - Mandalong Mine*.

RPS. (2023b). *LW30-31 Annual Monitoring Report - Mandalong Mine*.

RPS. (2023c). *LW32 Annual Monitoring Report - Mandalong Mine*.

RPS. (2023d). *Mandalong Aquatic Ecology Report - Extraction Areas LW25-29, LW30-31, LW32, LW34, LW39-43 and LW57-60*.

RPS. (2024). *LW34 Annual Monitoring Report - Mandalong Mine*.

RPS. (2024a). *LW25-29 Annual Monitoring Report - Mandalong Mine*.

RPS. (2024b). *LW30-31 Annual Monitoring Report - Mandalong Mine*.

RPS. (2024c). *LW32 Annual Monitoring Report - Mandalong Mine*.

RPS. (2024d). *Mandalong Aquatic Ecology Report - Extraction Areas LW25-29, LW30-31, LW32, LW34, LW39-43 and LW57-60*.

RPS. (2024e). *Mandalong Land Management Strategy - Annual Monitoring 2023*.

RPS. (2024f). *MSSS Rehabilitation Monitoring - 2023 Annual Report*.

SLR. (2013). *Mandalong Southern Extension Project EIS*.

SLR. (2014). *Northern Coal Logistics Project EIS*.

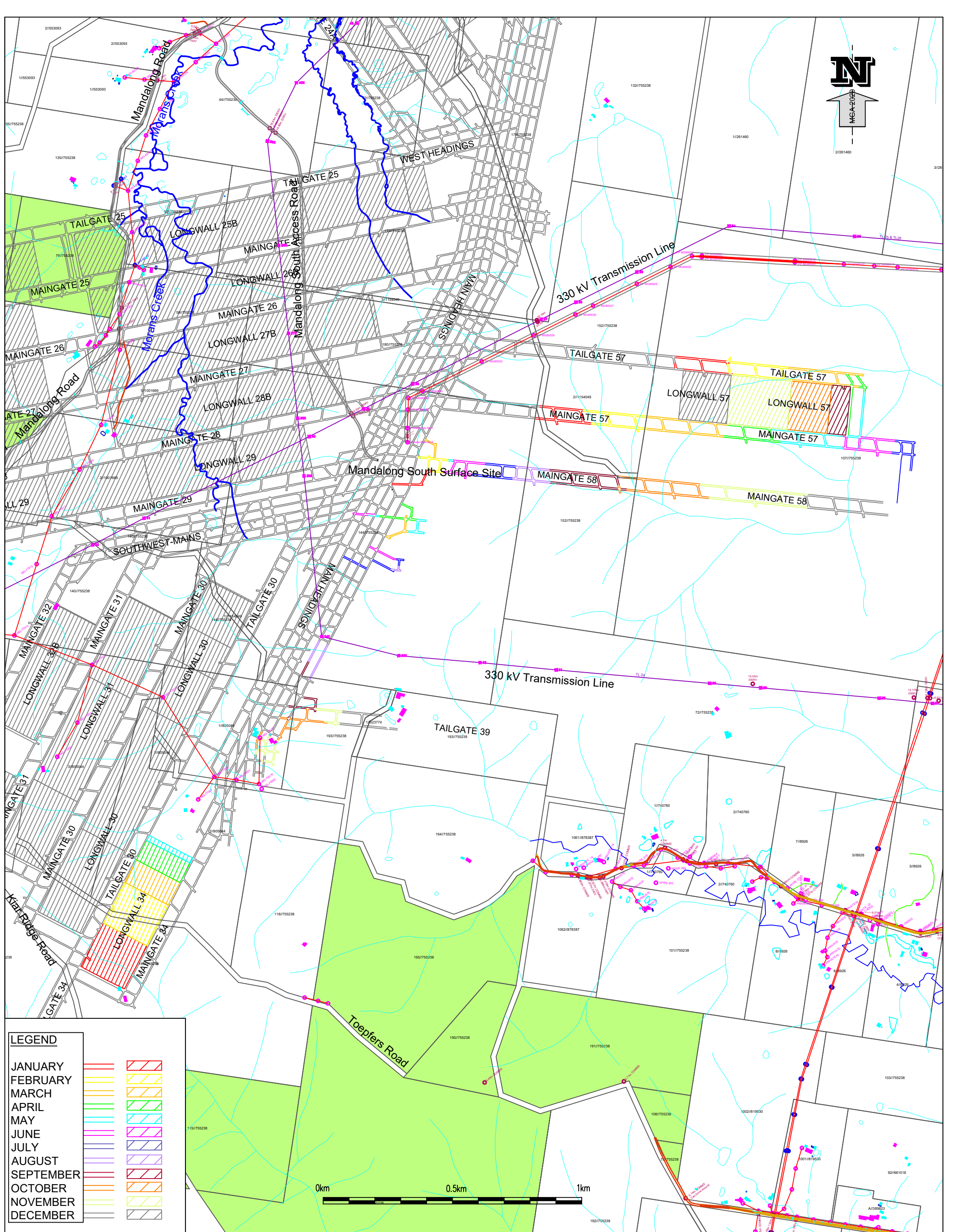
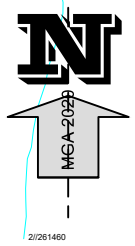
SLR. (2020). *Centennial Mandalong Land and Agricultural Resource Assessment LW30-LW33*.

Umwelt. (1997). *Cooranbong Colliery Life Extension Project Environmental Impact Statement*. Umwelt (Australia) Pty Ltd.

Umwelt. (2004). *Delta Link Project - Statement of Environmental Effects*.

Umwelt. (2021). *Mandalong Mine LW30-31 Extraction Plan - Heritage Management Plan*.

# PLANS



LEGEND	
JANUARY	
FEBRUARY	
MARCH	
APRIL	
MAY	
JUNE	
JULY	
AUGUST	
SEPTEMBER	
OCTOBER	
NOVEMBER	
DECEMBER	

	Creek
	Drainage Line
	Sealed Road
	330kV Transmission Line
	Dwelling
	Building
	Olney State Forest

LOCATION	MANDALONG
SEAM	WEST WALLARAH
DRAWN	C.N.A 14.02.2023
CHECKED	
APPROVED	
SCALE	1:12,500

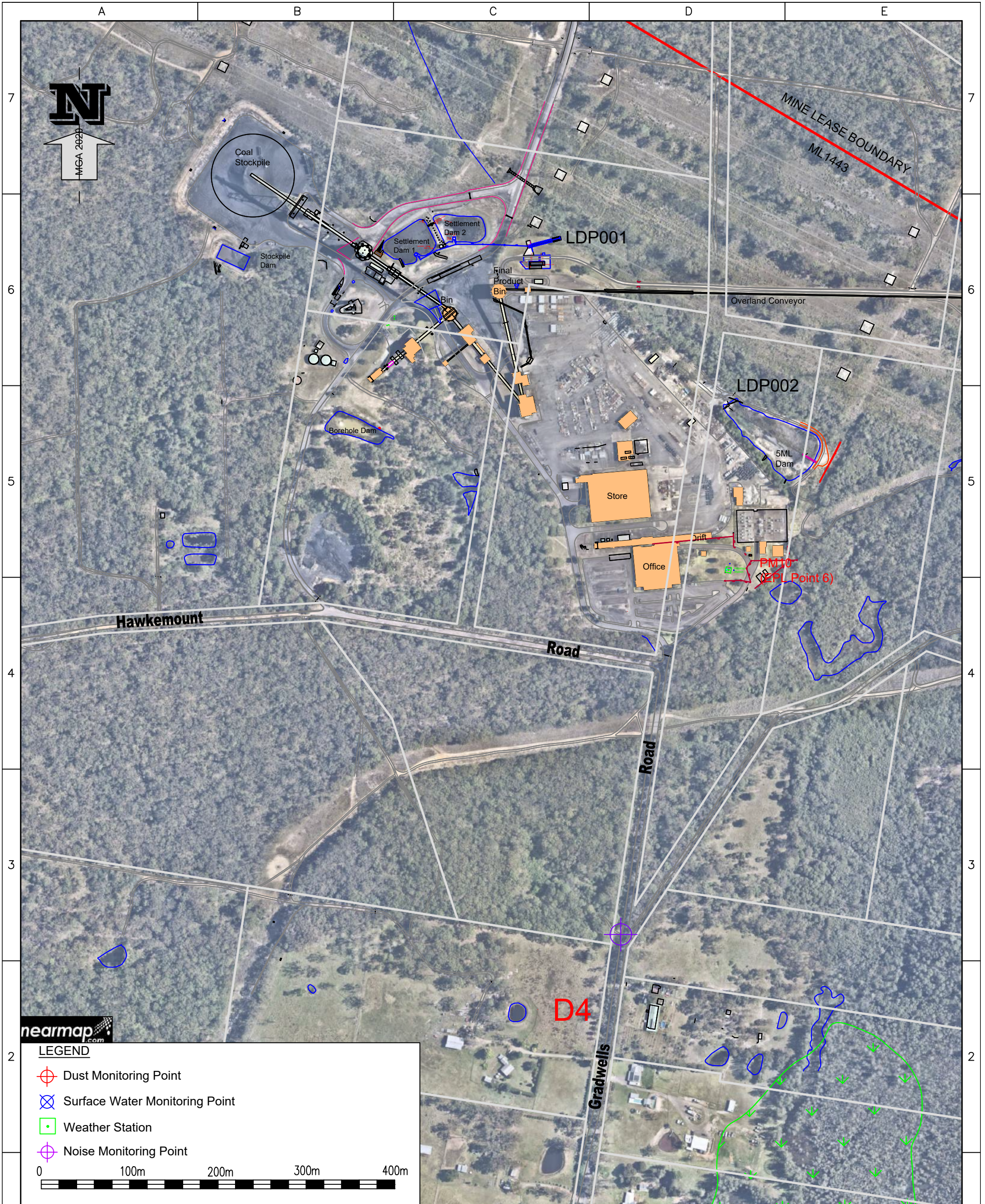


**CENTENNIAL  
MANDALONG**

**MONTHLY PRODUCTION  
2023**

CONTRACT No.	
PLOTFILE No. CM00310_rev1.pdf	
<b>A3</b>	<b>CM00310</b>
DRAWING REVISION	0 - 18.03.2024





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**LEGEND**

- Dust Monitoring Point
- Surface Water Monitoring Point
- Weather Station
- Noise Monitoring Point



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LOCATION	MANDALONG
SEAM	WEST WALLARAH
DRAWN	PJS 08/10/07
CHECKED	
APPROVED	

SCALE 1 : 4000



**Cooranbong Pit Top  
Location of Environmental Monitoring Points**

CONTRACT  
PLOTFILE CM00315\_rev0.pdf





**A3 CM00315b**

DRAWING REVISION 0 -22.02.23





**LEGEND**

-  Dust Monitoring Point
-  Surface Water Monitoring Point
-  Weather Station
-  Noise Monitoring Point

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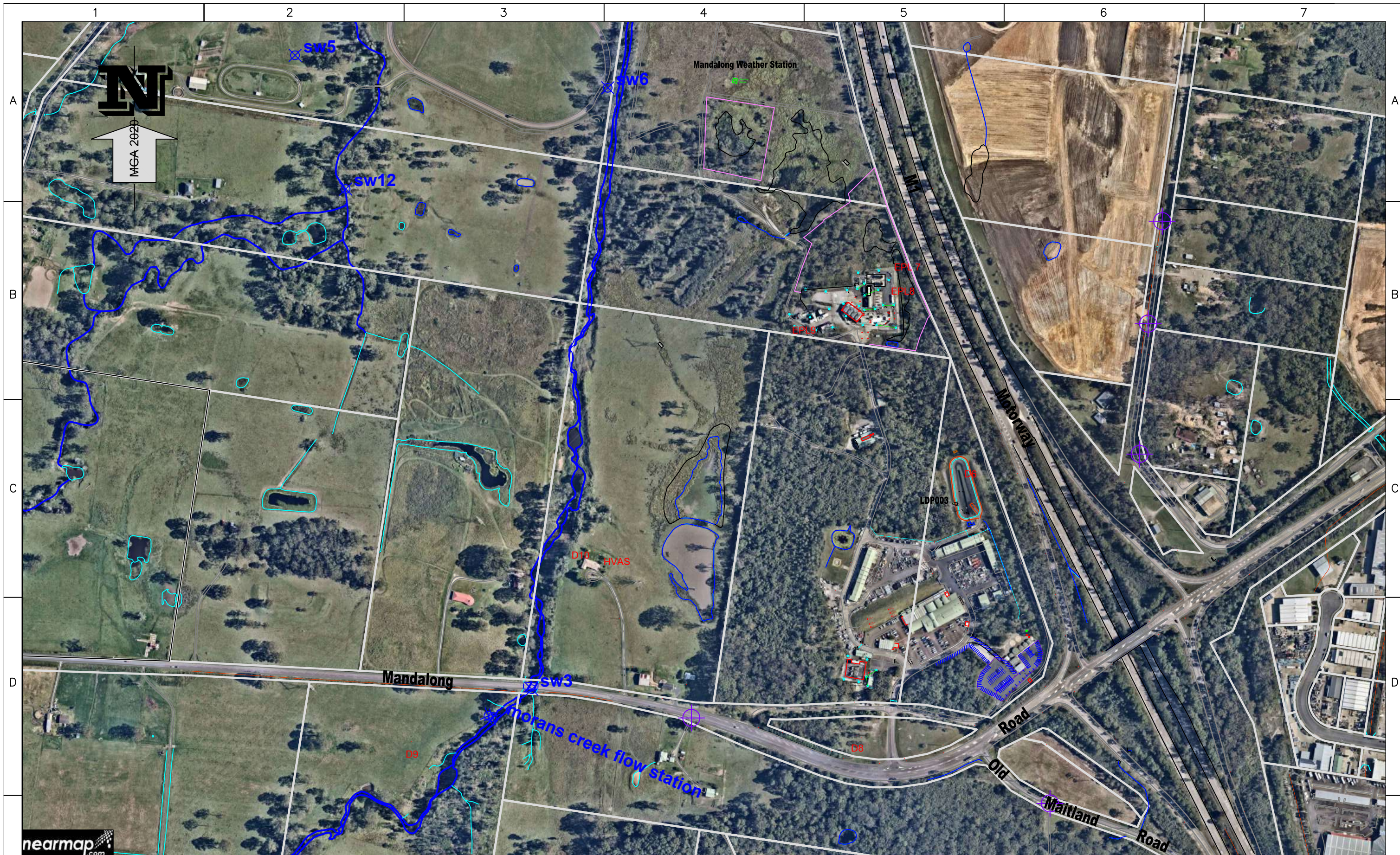
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SEAM	WEST WALLARAH
DRAWN	PJS 08/10/07
CHECKED	
APPROVED	
SCALE	1: 5000



**Delta Entry Site -  
 Location of Environmental Monitoring Points**

CONTRACT	
PLOTFILE: CM00315c_rev0.pdf	
<b>A3</b>	<b>CM00315c</b>
DRAWING REV.	0 - 22.02.2023





**LEGEND**

- Dust Monitoring Point
- Surface Water Monitoring Point
- Weather Station
- Noise Monitoring Point

0 100m 200m 300m 400m

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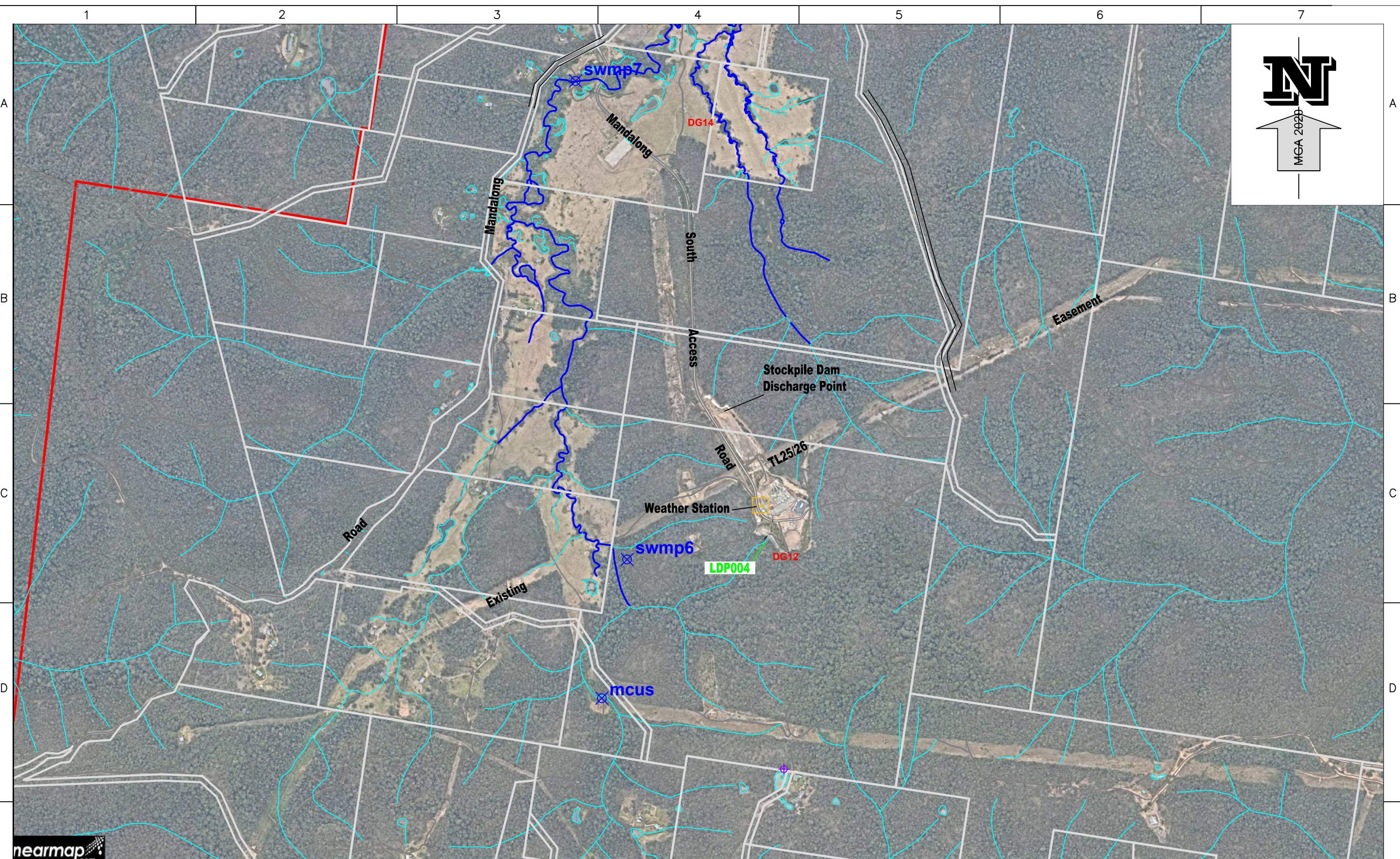
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DRAWN	PJS 08/10/07
CHECKED	
APPROVED	
SCALE	1 : 5,000

**Centennial Mandalong**

**Mandalong Mine**  
**Location of Environmental Monitoring Points**

CONTRACT	
PLOTFILE CM00315_rev0.pdf	
<b>A3</b>	<b>CM00315d</b>
REVISION	Rev 1 13/03/23





**LEGEND**

- Dust Monitoring Point
- Surface Water Monitoring Point
- Licence Discharge Point
- Weather Station
- Noise Monitoring Point

0 100m 200m 300m 400m

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LOCATION	MANDALONG
SEAM	WEST WALLARAH
DRAWN	PJS 08/10/07
CHECKED	
APPROVED	
SCALE	1 : 12,500

**Centennial Mandalong**

**Mandalong South Surface Site**  
**Location of Environmental Monitoring Points**

CONTRACT	
PLOTFILE CM00315_rev0.pdf	
<b>A3</b>	<b>CM00315F</b>
REVISION	0 22/02/2023



# APPENDICES

# Appendix 1: Independent Environmental Audit Action Plan



## Mandalong Mine Independent Environmental Audit 2022 – Action Plan

Approval & Condition Number	Recommendation	Action Owner	Action Description	Action Due Date	Completion Date
<p><b>SSD-5144</b> <b>S3 – 2</b></p>	<p><b>Operational Noise Criteria</b></p> <p><b>Low level non-compliance</b></p> <p><b>Auditor Finding:</b> Monitoring conducted by GHD at monitoring locations R16 and R17 on 6 December 2021 recorded noise criteria exceedances as follows-</p> <ul style="list-style-type: none"> <li>• R16 (Day) - 39dBa (criteria 35dBa).</li> <li>• R16 (Night) - 41dBa (criteria 35dBa).</li> <li>• R17 (Night) - 41dBa (criteria 35dBa).</li> </ul> <p>The operational ventilation fan speeds at the MSSS were increased from 540 revolutions per minute (rpm) to 615 rpm at 7.30am on 3/12/2021. The increase in fan speed was required to improve ventilation to the underground workings, specifically in Tailgate 34 (TG34) as a result of increased methane emission rates within the panel. The increase in fan speed was undertaken to ensure a safe working environment for underground employees in TG34.</p> <p>A Penalty Notice was issued to Centennial Mandalong on 17 March 2022 in relation to the December exceedances. The Penalty Notice requires the following actions to be undertaken:</p> <ul style="list-style-type: none"> <li>- increase frequency of monitoring of MSSS locations from quarterly to monthly for 12 months</li> <li>- prepare an Action Plan which commits to a timeline to implement engineering controls</li> </ul>	<p>Environmental Coordinator / Mandalong South Project Manager.</p>	<p>a) Implement MSSS Noise Mitigation Action Plan and provide further update to DPE in July 2022.</p> <p>b) Consult with DPE and EPA regarding timing to implement actions as timeframes in MSSS Noise Mitigation Action Plan are longer than EPA requirements in letter dated 10 March 2022.</p>	<p>a) Complete</p> <p>b) Complete</p>	<p>a) Quarterly updates provided to DPE in 2022 and 2023 until project completion (installation of three new outlet silencers) in October 2023.</p> <p>b) Action Plan submitted to DPE on 26 May 2022 and the EPA on 7 June 2022. The consultation with EPA included notification that the MSSS ventilation fan mitigation works were unable to be undertaken by 31 October 2022 (as required by EPA Warning Letter of 10 March 2022).</p>

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	<p>- maintain ventilation fan speeds at 540rpm until engineering controls are complete.</p> <p>Noise levels were compliant in the March 2022 monitoring. Centennial Mandalong confirmed that the Northern Region Noise Management Plan has been updated in March 2022 to include the requirement for monthly monitoring at MSSS sites, and monthly noise monitoring commenced in April 2022. The updated Northern Region Noise Management Plan was approved by the DPE on 24 March 2022. The Action Plan was provided to the DPE on 26 May 2022, which acknowledged receipt of the Action Plan on 30 May 2022.</p> <p><b>Recommendation:</b></p> <p>NC REC 1 - Implement MSSS Noise Mitigation Action Plan and provide further update to DPE in July 2022. Consult with DPE and EPA regarding timing to implement actions as timeframes in MSSS Noise Mitigation Action Plan are longer than EPA requirements in letter dated 10 March 2022.</p>				
<p><b>SSD-5144</b> <b>S3 – 13</b></p>	<p><b>Water Pollution</b></p> <p><b>Low level non-compliance</b></p> <p><b>Auditor Finding:</b></p> <p>There were incidents during the audit period as a result of significant rainfall above design parameters. Evidence of flocculation, incident management and reporting was provided by Centennial Mandalong.</p> <p>Non - Compliance 1: Discharge from MSSS Stockpile Dam</p>	<p>Environmental Coordinator</p>	<p>Update the Water Management Plan following recent DPE review and incident to include details on recent water management upgrades.</p>	<p>29 June 2022</p>	<p>Completed.</p> <p>Updated Water Management Plan provided to DPE on 29 June 2022.</p> <p>The Water Management Plan was approved by DPE on 23 December 2022.</p>

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	<p>on 27 July 2020.  Non - Compliance 2: Discharge from MSSS Stockpile Dam on 9 February 2020.  Non - Compliance 3: Discharge from MSSS Stockpile Dam on 2/3 March 2022  Centennial Mandalong confirmed that the pumping capacity was upgraded from 30 litres per second to 60 litres per second at the MSSS Stockpile Dam with dedicated diesel pumps in April 2022. The Water Management Plan is currently being updated following the March 2022 non-compliance.</p> <p><b>Recommendation:</b></p> <p>NC REC 2: Update the Water Management Plan following recent DPE review and incident to include details on recent water management upgrades e.g. pumping capacity.</p>				
<p><b>EPL 365 M2.2</b></p>	<p><b>Air Monitoring Requirements</b></p> <p><b>Low level non-compliance</b></p> <p><b>Auditor Finding:</b></p> <p>Non – Compliance - Monitoring Point 6 failed to monitor PM10 continuously in accordance with Condition M2.2 during the reporting period due to equipment malfunction, power outages or planned maintenance activities.  Monitoring was conducted on 345 days in 2021 (94.5% availability).</p>	<p>Environmental Coordinator /  Cooranbong CHP Superintendent</p>	<p>Investigate options for SMS alarms in the event of equipment malfunction or power outages to ensure a faster response time to faults or power outages.</p>	<p>31 December 2022</p>	<p>Completed.</p> <p>The installation of an electrical apparatus, an uninterruptible power supply (UPS) device that allows the dust monitor to keep running for at least a short time when incoming power is interrupted was completed in July 2022.  This will reduce the impact of future unplanned power</p>

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	<p>Centennial Mandalong stated that In the event of power outages, a reset of the monitoring equipment is undertaken by an environmental technician or site electrical personnel.</p> <p><b>Recommendation:</b></p> <p>NC REC 3: Investigate options for SMS alarms in the event of equipment malfunction or power outages to ensure a faster response time to faults or power outages.</p>				outages.
<p><b>SSD-5144</b> <b>S2 - 13</b></p>	<p><b>Recommendation</b></p> <p>IMP REC 1</p> <p>Continue to work with DPE to surrender DA 97/800 in accordance with EP&amp;A Act.</p>	<p>Environmental Coordinator</p>	<p>DPE have granted an extension to surrender DA97/800 until 30 September 2022.</p>	<p>30 September 2022</p>	<p>Completed.</p> <p>A notice of consent surrender was submitted to DPE on 10 August 2022.</p> <p>The Department notified Centennial Mandalong on 29 August 2023 that DA97/800 had been voluntarily surrendered pursuant to section 4.63 of the Environmental Planning and Assessment Act 1979 and section 68 of the Environmental Planning and Assessment Regulation 2021.</p>
<p><b>SSD-5144</b> <b>S3 - 3</b></p>		<p>Environmental Coordinator</p>	<p>Update Noise Management Plan to address predictions and forecasting (or explain why not required).</p>	<p>24 October 2022</p>	<p>The following advice was provided by a GHD noise expert on this recommendation on 8 August 2022 –</p>



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	<p><b>Recommendation</b></p> <p>IMP REC 2</p> <p>The Northern Region Noise Management Plan should be updated to address predictions and forecasting (or explain why not required).</p>			<p>Revision of Noise Management Plan to be undertaken within 3 months of the IEA report submission and within 4 weeks of conducting the review in accordance with Condition 7(c) Schedule 6 of SSD-5144</p>	<p><i>The recent MSSS calibrated noise model assessment for the mitigation works has generated a calibrated noise model for the existing MSSS vent fan operation. In addition, as part of this assessment the noise modelling will forecast the likely noise levels under worst-case operational conditions under noise enhancing conditions for the MSSS and the proposed mitigation works.</i></p> <p>Therefore, an update to the Noise Management Plan is not required at this time.</p>
<p><b>SSD-5144</b> <b>S3 - 17</b></p>	<p><b>Recommendation</b></p> <p>IMP REC 3</p> <p>Drain leading to MMAS Helipad Dam needs haybales or similar (possibly small rock structure) to manage heavy flow. Current sediment fence not adequate for concentrated flow.</p>	<p>Environmental Coordinator</p>	<p>Review and upgrade helipad sediment controls.</p>	<p>30 September 2022</p>	<p>The helipad sediment controls have been reviewed by the Environment &amp; Community Superintendent.</p> <p>The sediment controls were installed in 2020 when a drain was installed to reduce water pooling on helipad. The drain is now grassed and stable. The</p>

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					sediment controls are no longer required and were removed on 20 July 2022.
SSD-5144 S3 - 17	<p><b>Recommendation</b></p> <p>IMP REC 4</p> <p>Repair catch drains on the access road to the MMAS ventilation facility (near pit top). The drains have become blocked with gravel and sediment.</p>	Environmental Coordinator	Review and upgrade ventilation fan access road drains.	30 September 2022	Completed. Catch drains were repaired on 24 August 2022.
SSD-5144 S3 - 17	<p><b>Recommendation</b></p> <p>IMP REC 5</p> <p>There is some minor erosion along roads at MSSS that can be repaired. There is a drain at MSSS that needs to be re-graded as water from this drain is unlikely to drain to the sediment dam. It appears the grades in the middle of the drain are slightly higher than the at the end of the drain.</p>	Environmental Coordinator / Mandalong South Project Manager.	Repair erosion along MSSS roads and re-grade drain to Sediment Dam.	30 September 2022	Completed. Erosion along MSSS roadway and re-grade of drain to the Sediment Dam were completed in September 2022.
SSD-5144 S3 - 19	<p><b>Recommendation</b></p> <p>IMP REC 6</p> <p>Include any details of vertebrate pest (ferals) management in the Annual Review.</p>	Environmental Coordinator	2022 Annual Review to include details on vertebrate pest management	31 March 2023	Completed. Included in Section 8.2.7 of the Mandalong 2022 Annual Review.
SSD-5144 S3 - 19	<p><b>Recommendation</b></p> <p>IMP REC 7</p> <p>Check ratio to replace hollow bearing trees with nest boxes is consistent across documentation</p>	Environmental Coordinator	Review ratio to replace hollow bearing trees with nest boxes is consistent across documentation	31 December 2022	Schedule 3 Condition 19 of SSD-5144 requires <i>"...replace cleared hollow-bearing trees with appropriate nest boxes at a ratio of at least 2:1."</i>

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					<p>SSD-5144 Appendix 8: Statement of Commitments Flora &amp; Fauna for the construction of the MSSS includes a commitment that nest boxes will be installed at a ratio of 1:1 (i.e. one nest box for every one habitat hollow removed).</p> <p>SSD-5144 Appendix 8: Statement of Commitments (Mod 7 – construction of a 33kV powerline) includes a commitment that hollow bearing trees are to be replaced by nest boxes at a ratio of at least 1:1.</p> <p>MSSS construction – 18 hollows were removed, and 18 nest boxes were installed.</p> <p>TL24 relocation – 79 hollows were removed, and 140 nest boxes were installed.</p> <p>33kV powerline construction – 170 hollows were removed, and 170</p>

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					next boxes were installed.
<b>SSD-5144 S3-31 &amp; ML 1722 Condition 2</b>	<b>Recommendation</b>  IMP REC 8  The ongoing weed management program should target Rhodes grass in rehabilitation areas and reduce the spread into future rehabilitation areas at the MSSS	Environmental Coordinator	MSSS weed management program to target Rhodes Grass in rehabilitation areas.	31 December 2022	Ongoing.  Kleinfelder commenced works at the MSSS targeting Rhodes Grass in August 2022. These works continued in late 2022 and 2023 and will continue in 2024.
<b>SSD-5144 S3-32 &amp; ML 1722 Condition 2</b>	<b>Recommendation</b>  IMP REC 9  Undertake rehabilitation of the MSSS stockpile to achieve the temporary final landform.	Environmental Coordinator	Complete rehabilitation of the MSSS stockpile.	31 December 2022	Completed  Shaping and hydro-seeding completed in October 2022.
<b>SSD-5144 S3-32 &amp; ML 1722 Condition 2</b>	<b>Recommendation</b>  IMP REC 10  Review cover crops species proposed for MSSS stockpile to ensure includes native species that will survive until mine closure (15 years).	Environmental Coordinator	Complete a review of the cover crops species proposed for MSSS stockpile to ensure includes native species that will survive until mine closure (15 years).	31 August 2022	Completed.  Global Soil Systems confirmed seed list for MSSS stockpile rehabilitation is as per the SLR Rehabilitation Management Plan recommendation.  Mandalong will monitor the rehabilitation success to determine if future native species seeding is required.



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SSD-5144 S3-33	<p><b>Recommendation</b></p> <p>IMP REC 11</p> <p>Major changes to Schedule 3 Condition 33 as a result of Mod 10 should be addressed in the preparation of the RMP by Centennial Mandalong.</p>	Environmental Coordinator	Prepare Rehabilitation Strategy	30 September 2022	<p>Completed.</p> <p>Rehabilitation Strategy submitted to DPE for approval on 30 September 2022.</p>
SSD-5144 S4-1	<p><b>Recommendation</b></p> <p>IMP REC 12</p> <p>The Subsidence Impact Performance Measure table in the Annual Review should include an extra column with current status of each feature</p>	Mining Approvals Coordinator	2022 Annual Review to include status of each feature in Subsidence Impact Performance Measure table.	31 March 2023	<p>Completed.</p> <p>Addressed in Table 6-25 of the 2023 Annual Review.</p>
SSD-5144 S6-7	<p><b>Recommendation</b></p> <p>IMP REC 13</p> <p>The date of previous revisions should be included in future management plan updates</p>	Environmental Coordinator	The date of previous revisions will be included in future management plan updates.	Noted	Ongoing
SSD-5144 SOC Flora & Fauna	<p><b>Recommendation</b></p> <p>IMP REC 14</p> <p>Dirty equipment to be washed prior to leaving MSSS to prevent spread of sediment offsite.</p>	Mandalong South Project Manager.	Centennial Mandalong to ensure equipment cleaned prior to leaving the MSSS.	Noted	Ongoing
SSD-5144 SOC Bushfire	<p><b>Recommendation</b></p> <p>IMP REC 15</p> <p>Investigate options for a dedicated bunker/safe space at</p>	Mandalong South Project Manager.	Following the completion of construction, Centennial Mandalong will investigate options for a dedicated bunker/safe	31 December 2024	Completed – designated safe space has been determined at MSSS and sign-posted. Inspected by RFS in February 2024 and

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	MSSS in consultation with RFS.		space at MSSS in consultation with RFS.		deemed adequate.
<b>ML 1793 Condition 2</b>	<p><b>Recommendation</b></p> <p>IMP REC 16</p> <p>Area at Cooranbong above conveyor drift requires additional stabilisation</p>	Environmental Coordinator	Additional stabilisation to be considered above the Cooranbong conveyor drift.	31 December 2022	<p>Completed.</p> <p>Additional seeding was undertaken and the area was stable as of December 2022.</p>



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